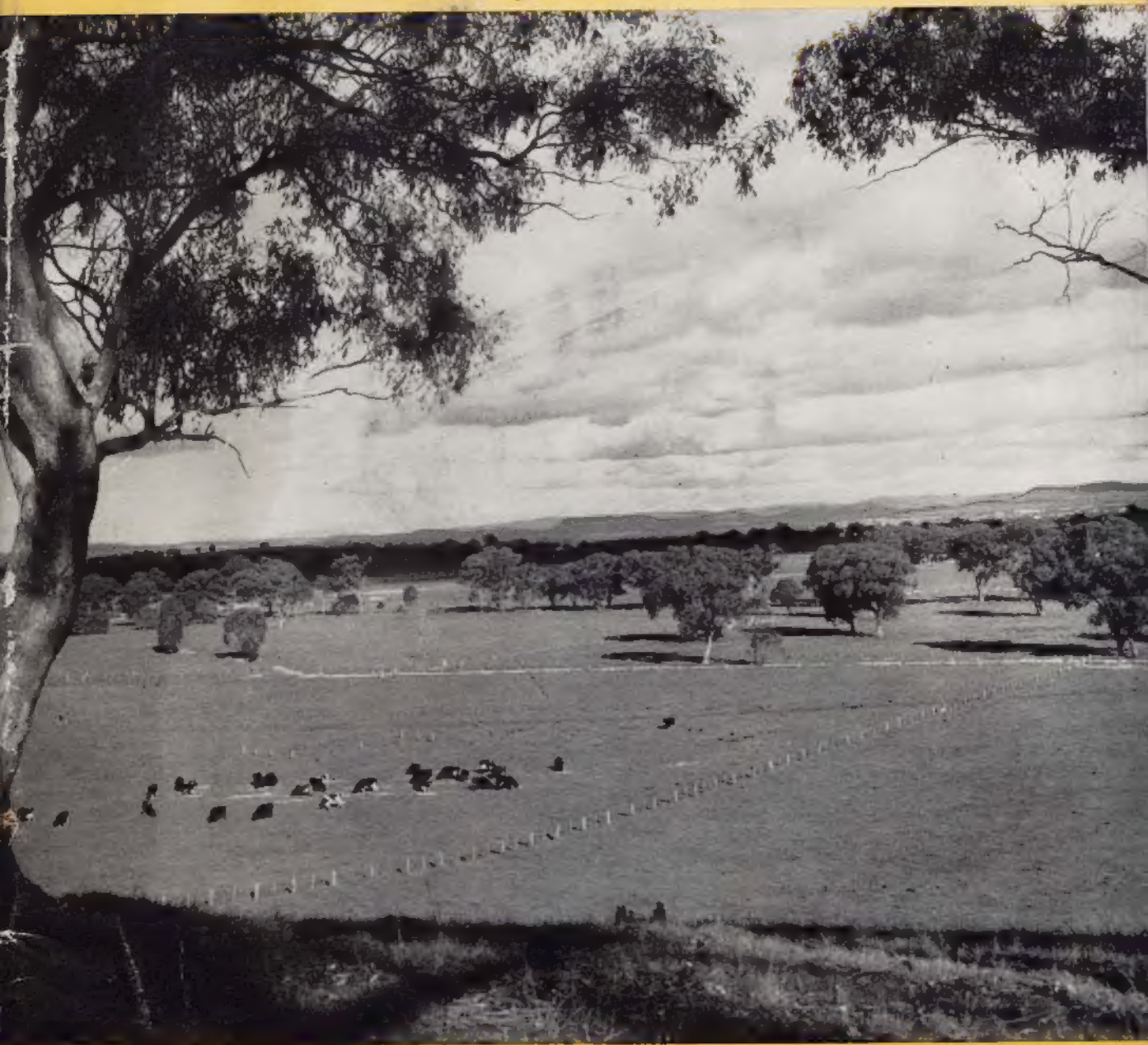
The Journal of

# AGRICULTURE

PUBLISHED BY THE VICTORIAN DEPARTMENT OF AGRICULTURE



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# The Journal of AGRICULTURE

PUBLISHED BY THE VICTORIAN DEPARTMENT OF AGRICULTURE

JUNE, 1963

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*Editor : V. C. G. Lewis*


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**Cover—**

Feeding out grass hay to the dairy herd at Ruthergien Research Station.

*[Photograph by E. Domeyer.*


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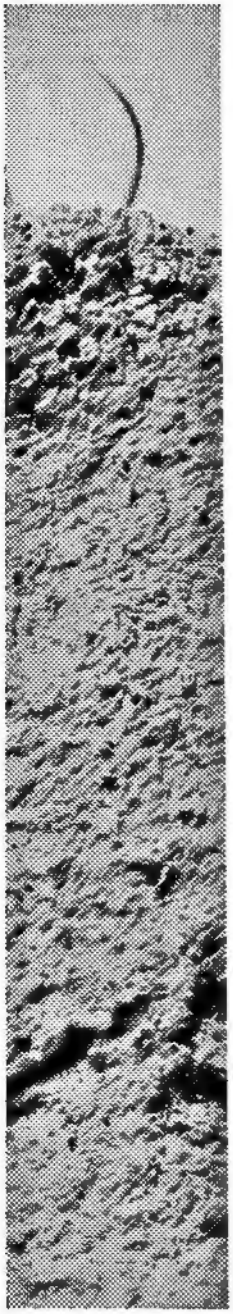

THE GREAT THIRST . . . the hand of time moves across the thirsty land.

No story promises to be more dramatic, more vital, more etched with brilliance than the harnessing of Australia's water resources. Nothing will add more to our expansion and security. Water will pipe the tune to our progress.

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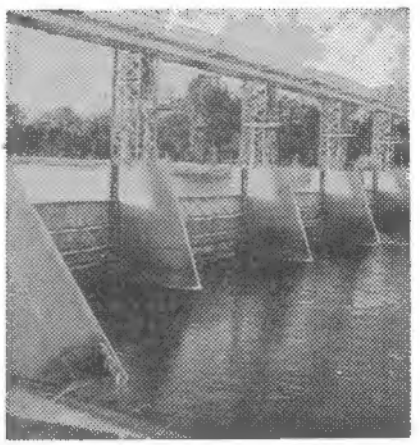
*Gogeldrie Weir on the Murrumbidgee—downstream of the main canal supplying the new Coleambally Irrigation Area.*



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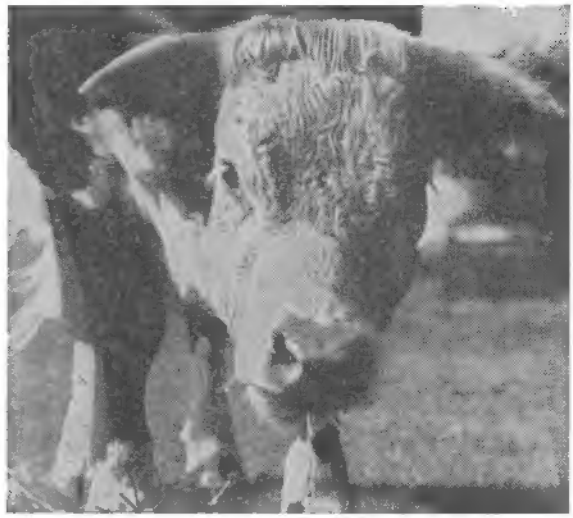


*The East Gippsland Region*

# LAND DEVELOPMENT AND PASTURE IMPROVEMENT

## *No. 3.—Soil Preparation and Suitable Grasses and Clovers*

F. R. Drake, B.Agr.Sc., District Agricultural Officer and J. K. Kehoe, B.Agr.Sc.

The first and second instalments of this series of articles on the East Gippsland Region of Victoria appeared in the February and May, 1963 issues of this Journal

The perennial native grasses, including the well known wallaby grasses (*Danthonia* spp.), kangaroo grass (*Themeda australis*), weeping grass (*Microlaena stipoides*) and spear grasses (*Stipa* spp.) are still of major importance in East Gippsland pastures. Here they show a higher degree of persistence in top-dressed pastures than in pastures similarly treated in western Victoria. This is believed to be due to the more abundant summer rainfall in East Gippsland.

On most natural pastures of the Region, top-dressing with superphosphate will result in an increased growth of volunteer clovers and trefoils. Quicker results are normally obtained by introducing clover seed with the earlier applications of superphosphate, either broadcast or drilled into the pasture. In this way a native grass and clover combination can be established in the pasture and often satisfactorily maintained over long periods by appropriate manurial treatment.

In some cases where liberal top-dressing with superphosphate is continued and heavy stocking achieved, the native perennial grasses give way to other species. Often, volunteer grasses such as couch grass (*Cynodon dactylon*), pigeon grass (*Setaria geniculata*), soft brome (*Bromus mollis*), silver grass (*Vulpia* sp.), and others of lesser importance will appear and contribute a substantial amount of the feed according to the seasonal incidence of rainfall.

Dairy cows on sown pasture, Lakes Entrance District.

Such a pasture consisting of native perennials, volunteer grasses and introduced clovers has a substantially increased carrying capacity and represents the objective of many graziers particularly where cultivation is not practicable.

If the landholder is seeking the highest production per acre and where cultivation is possible, it is usual to sow down with introduced pasture species.

## CULTIVATION

The beneficial effect of careful and adequate cultivation on pasture establishment and the development of sown pasture in the first year is so important that East Gippsland farmers should give careful attention to it. In too many cases expensive seed mixtures are sown on poorly prepared seedbeds, with disappointing results.

Marked improvement in the early growth of new pastures, which no fertilizer can achieve, can be brought about by sowing early, preferably in March, on a well worked seedbed, which has been clean fallowed through the summer. The actual method of cultivation, whether ploughing, discing, rotary hoeing or a combination of methods, is usually determined by the physical nature of the soil and terrain, but is immaterial provided the fallow is kept free of weeds and re-growth.

This marked beneficial effect of clean fallow and early autumn sowing is particularly important on land cleared from bush or grass-tree plain country. The grass-tree plains east of Orbost constitute a special problem and here, up to two years clean fallowing after the initial ploughing is recommended.

On land infested with burgans scrub some bulldozing may be required before ploughing to remove fallen logs, stumps and scattered trees. Bulldozer blades fitted with a rake or grubber attachment are more suitable for this work as less soil will then be packed with the scrub. The roots of large burgans can be more effectively dislodged and some measure of initial cultivation will be achieved. Following bulldozing, the initial ploughing is best done with a heavy stump-jump disc plough or chisel plough which will dislodge most of the roots.

On burgans land, a long fallow or an oat crop for feeding off, followed by re-ploughing before sowing to permanent pasture, will greatly reduce the burgans' seedling population or regrowth from old roots.

## INTRODUCED GRASSES AND CLOVERS

The introduced pasture plants, perennial rye grass, cocksfoot, subterranean clover and white clover are the most important for

Clover variety trials near Bairnsdale.

Trials comparing different pasture species and mixtures.

sowing pastures in East Gippsland. Others commonly sown include Italian rye grass, H1 rye grass, Wimmera rye grass, Phalaris tuberosa, Paspalum dilatatum, red clover, strawberry clover, cluster clover and crimson clover.

## The Rye Grasses

Most pasture sowings include one or more of the rye grasses. On the heavier and more fertile soils, perennial rye grass is the most persistent and productive of all the grasses under heavy grazing. On the less fertile soils it is relatively unproductive and on the lighter textured soils will tend to die out after a year or two.

Italian rye grass is an annual or sometimes biennial plant which provides good feed in the year of sowing, but very little thereafter. It is sometimes used as a winter grazing crop, but for pasture sowings has been largely replaced by H1 rye grass. H1 rye grass is a hybrid between Italian and perennial rye grass and is widely used to provide palatable winter feed. It is more persistent than Italian rye grass but likely to thin out drastically during a summer drought. High soil fertility is needed for worthwhile winter production and H1 rye grass is not a suitable grass for sowing on unimproved or infertile land.

Wimmera rye grass is an annual plant and must start afresh from seed germinating in autumn each year. It tends to disappear after a year or two, but may be re-invigorated by an occasional shallow cultivation. It is sown only on the lighter soils where perennial rye grass does not persist.

## Cocksfoot

Cocksfoot is a vigorous deep rooting perennial grass which is often associated with rye grass in mixed pastures and is likely to be more persistent than the latter on the less compact soils. It is well suited to most East Gippsland conditions because of its capacity to respond to summer rains and should be included in most seed mixtures for sowing pastures in the Region. It is likely to be thinned out by the intensive grazing which may accompany heavy stocking with sheep during dry weather.

Recently introduced cocksfoot varieties, of which Currie cocksfoot is the best known, are showing considerable promise of being more drought resistant and capable of better winter growth than the varieties at present in common use. Seed of Currie cocksfoot is at present scarce and dear, but as it becomes more readily available, is recommended for trial.

## Paspalum Dilatatum

Paspalum dilatatum is a perennial grass which is well known throughout the summer rainfall areas of eastern Australia. It makes

most of its growth during the spring and summer and is completely dormant during the cold weather. In the areas of high summer rainfall it grows vigorously and is inclined to dominate the other grasses, thus leading to a pasture which is unproductive during the winter.

Throughout most of East Gippsland this does not happen and paspalum is able to live along with the winter growing species in a mixed pasture. It is a grass which is able to grow in a wide range of soils and can withstand dry spells and respond to summer rains as and when they fall, thus providing a green pick which sheep seek out keenly. If adequately manured and stocked with sheep, the grass does not dominate the pastures to the detriment of the winter growing species.

### Phalaris Tuberosa

Phalaris tuberosa is a perennial grass which has given satisfactory results as a pasture plant in many parts of East Gippsland. It is a vigorous deep rooted plant able to grow on the lighter textured soil types on which perennial rye grass fails to hold. It is also able to survive longer dry spells and persist under more difficult conditions. In spite of these good qualities, the grass has not been fully accepted by district farmers. It is generally regarded as being unpalatable to stock and likely to become coarse and tussocky. It is also known to cause "phalaris staggers" in sheep, and is regarded with reservations on that account.

Where rye grass and cocksfoot pastures can be maintained there is little need for phalaris. Consequently this grass is usually reserved for the poorer soils and drier slopes.

Pasture plots on the Mario plains.

Phalaris grows vigorously on the deep silty soils of the river flats, but on the poorer soils it is likely to settle down as a persistent but rather unproductive pasture unless special steps are taken to improve soil fertility.

### Phalaris Arundinacea

Phalaris arundinacea, (Reed Canary Grass) has shown some promise in the East Gippsland Region as a grass for swampy areas. When well established it is able to survive periodical inundation. In one trial it showed a fair degree of salt tolerance.

### Perennial Veldt Grass

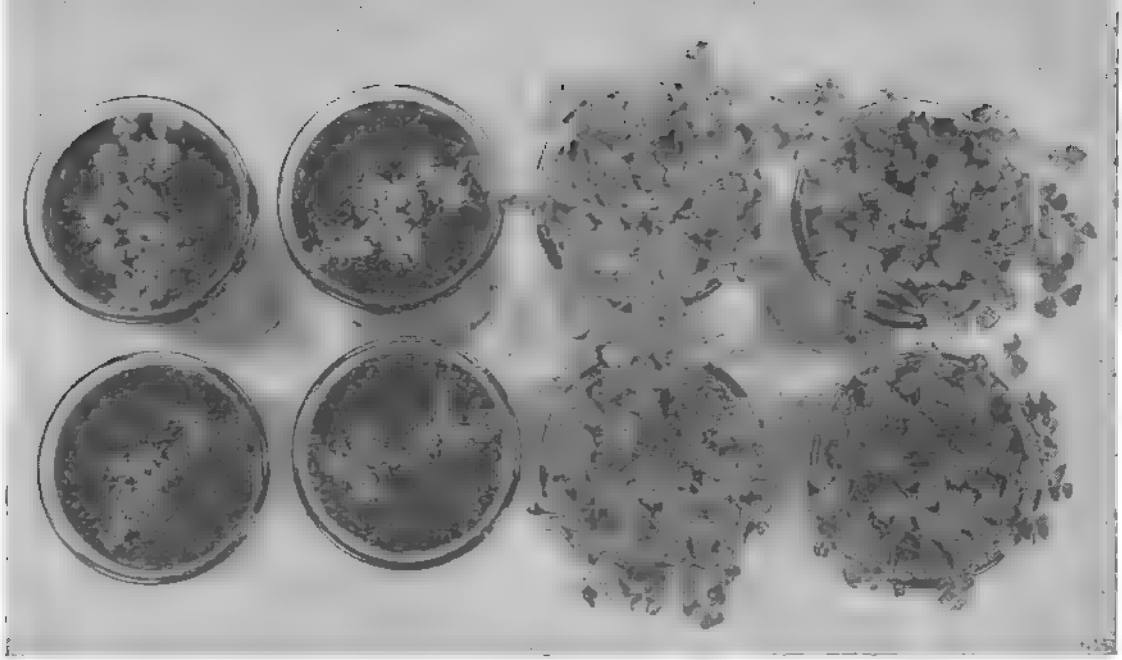
Perennial veldt grass has been sown and has become well established on some of the lighter deep sands. It is able to grow on soils of low fertility and under such conditions may compete to their disadvantage with other species requiring better conditions. Because of its lack of persistence in some sowings it is as yet uncertain whether the grass will have a permanent place in the development of the lighter areas.

### Kikuyu

Kikuyu is a useful couch-type grass for special circumstances, for example, deep sand ridges or sandy hillsides. This grass does not produce seed in commercial quantities and must be established by pieces of runner, or preferably pieces of sod. The process of establishment is slow, but if care and patience are exercised over a period of years, difficult patches of properties can be grassed over. A shovelful of fresh animal manure placed with each sod of kikuyu will greatly accelerate its establishment.

### White Clover

White clover is a perennial plant and where soil fertility and rainfall are adequate, is the most productive of all clovers. It is able to persist in most East Gippsland pastures, dominating in the heavier and damper soils but giving way to annual clovers in the lighter drier soils. In the lighter drier soils its performance varies from year to year according to seasonal conditions, but it is worth including in nearly all pasture sowings for the Region as it is desirable to have a perennial clover present which is able to respond to the summer rains which are normal in most years. Of the varieties available, New Zealand Certified has proved generally satisfactory.



The beneficial effect of fallow on subterranean clover establishment is illustrated above. The soil in the four pots (right) was taken from a bush paddock cleared and fallowed for twelve months. Soil in the four pots (left) came from an adjacent unfallowed area. Fertilizer treatments were :—

Top row of four pots—superphosphate and lime (1 and 1) 4 cwt. per acre drilled.

Bottom row of four plots—superphosphate 2 cwt. per acre broadcast.

### Strawberry Clover

Strawberry clover is another well known perennial clover which has a special value for damp and slightly saline soils.

### Subterranean Clover

Subterranean clover is an annual clover which persists from year to year by re-seeding, and is the most important clover in the Region, especially in the preliminary stages of pasture improvement. Its ability to become established and grow vigorously on poor soils, leading to a rapid build up in fertility, is of outstanding value. It produces a heavy seed crop which provides nutritious summer feed for sheep and accounts in large measure for the way in which sheep thrive on good subterranean clover pastures during dry spells.

Subterranean clover is sometimes seriously affected by the development of rust, a disease which may appear under humid conditions in the late spring and seriously shorten the growing season. Trials are in progress with rust resistant varieties.

Typical sheep and cattle country at Dargo.

Of the now large number of varieties of subterranean clover of which seed is available commercially, district trials to date indicate that the standard variety Mount Barker is still able to hold its own with the later introductions under most conditions. Yarloop is an early variety which is able to grow in water-logged soils. It also makes better early growth than Mount Barker, but it ceases growth earlier in the season. Under some conditions

a mixture of the two is suggested. Bacchus Marsh is a strain with a maturity date between the above two varieties and will give better autumn feed than Mount Barker.

Investigations to evaluate other varieties of subterranean clover are continuing, but for the present it is suggested that special advice be obtained before seed of any variety other than the three mentioned above, is sown.

### Crimson Clover

Crimsom clover is an annual which is often successful under difficult conditions on the lighter soil types. It is therefore a useful pioneer plant. It persists by reseeding but generally disappears after a few years, as other species become more firmly established.

### Cluster or Ball Clover

Cluster or ball clover is another annual which is already widely distributed throughout the Region in top-dressed pastures. It is also a useful pioneer plant on the lighter soils.

### Red Clover

Red clover is a vigorous but rather short-lived perennial clover, often useful in first sowings on newly cleared forest land. It is also useful in short term pastures to be cut for hay. The type sold as "New Zealand Cowgrass" has been found the most useful under East Gippsland conditions.

Other grasses and clovers are of course available and in use for special circumstances but a selection from those mentioned above will fill most requirements.

Trials are in progress in East Gippsland with species and strains other than those mentioned above, and results and observations will be made public from time to time.

## SEEDS MIXTURES

The modern trend generally followed is towards quite simple seeds mixtures. However, the East Gippsland climate is so variable, with summer rains usually at least equal to and often greater than winter rains, that it is desirable to include species capable of responding to rain whenever it falls. A few specimen seeds mixtures only are listed. Advice on species and mixtures suitable for special conditions is always available from district advisory officers of the Department of Agriculture. Seeding rates shown are pounds weight per acre.

### PASTURE SEEDS MIXTURES FOR EAST GIPPSLAND REGION

*General Purpose Mixtures for Fertile Soils :—*

| | lb. |
|---|---|
| Perennial rye grass, Victorian or N.Z. Certified | 8 |
| H1 rye grass | 5 |
| Cocksfoot | 3 |
| Subterranean Clover, Mount Barker | 3 |
| White Clover, N.Z. Certified | 1 |

Paspalum dilatatum at 2 lb. could be added if desired to this mixture.

When Phalaris tuberosa is sown it is usual to omit rye grass, but it may be sown in mixture with cocksfoot.

Following are suitable mixtures :—

| | lb. |
|---|---|
| Phalaris tuberosa | 2 |
| Subterranean clover | 3 |
| White Clover, N.Z. Certified | 1 |

or as above with cocksfoot 3 lb. added.

*Mixture for Red Gum Plains :—*

| | lb. |
|---|---|
| Perennial rye grass, Victorian Certified | 6 |
| Cocksfoot | 3 |
| Paspalum dilatatum | 2 |
| Subterranean clover, Mount Barker | 3 |
| White Clover, N.Z. Certified | ½ |

*Mixture for Sandy Soils :—*

| | lb. |
|---|---|
| Perennial Victorian Certified or Wimmera rye grass | 3 |
| Cocksfoot | 2 |
| Paspalum dilatatum | 2 |
| Subterranean clover, Mount Barker or Bacchus Marsh | 3 |
| Crimson Clover | 1 |
| White clover, N.Z. Certified | ½ |
| Cluster clover | ½ |

*Temporary Pasture often used for Hay :—*

| | lb. |
|---|---|
| Italian or H1 rye grass | 4 |
| New Zealand Cowgrass | 4 |

*Mixture for Grassmere Plains :—*

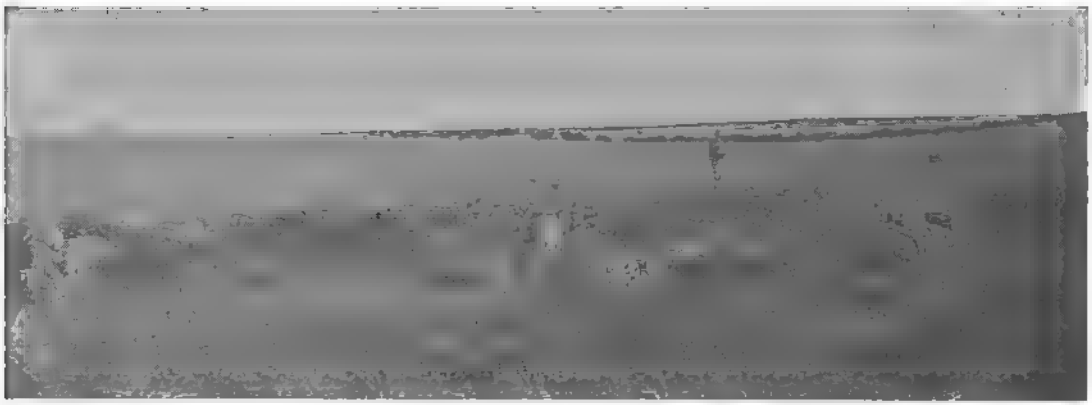
| | lb. |
|---|---|
| Perennial rye grass, Victorian Certified | 4 |
| Cocksfoot | 3 |
| Paspalum dilatatum | 3 |
| Subterranean clover, Mount Barker | 2 |
| Subterranean clover, Tallarook | 2 |
| White clover, N.Z. Certified | 1 |

The fourth and final instalment in this series of articles on Land Development and Pasture Improvement in East Gippsland will appear in a subsequent issue of this Journal.

The following report on - - - -

# Fat Lamb Investigations at the Mallee Research Station, Walpeup

- - - - was prepared by H. J. Sims, M.Agr.Sc., B.Com., Senior Agronomist,
and H. P. Mann, B.Agr.Sc., Manager



Merino ewes and lambs in the fat lamb trials at the Mallee Research Station, Walpeup.

Investigations with sheep at the Mallee Research Station, Walpeup, have been mainly concerned with fat lamb production and supplementary feeding. This report summarises results of the following experiments on fat lamb production:

★ A comparison of the suitability as fat lamb mothers of Border Leicester x Merino, Dorset Horn x Merino, Corriedale x Merino, and Merino ewes when mated with Dorset Horn rams.

Under current price levels, highest fat lamb and gross financial returns were obtained from the Border Leicester x Merino ewe.

★ A comparison of the suitability of Border Leicester, Dorset Horn, and Corriedale rams for the production of fat lambs when mated with several types of ewe.

The Dorset Horn proved to be the most suitable sire of early fat lambs under these conditions.

★ The influence of sire type on fat lambs.

A higher percentage of first grade lambs was sired by good-type Dorset Horn rams than by those of a poorer type.

★ The production of earlier lambs by mating earlier and using teaser rams.

A more concentrated drop of lambs was obtained after using teaser rams before joining Dorset Horn rams to Merino ewes in mid-October.

★ The possibility of weaning lambs early, especially in drier seasons.

When feed is short, early weaning can be an advantage as long as suitable feed is available for the lambs. Under normal conditions, better results are obtained by leaving the lambs with their mothers.

## Experimental Method

In all trials, the breeding, birth date, and sex of each lamb have been recorded, and regular weighings have been made during the growth of the lambs.

In comparisons of the suitability of various breeds as fat lamb mothers and sires, dressed weight and export grade of each lamb and the average skin weight and classification for each group of lambs were recorded. In the experiments comparing different types

Best financial returns have been obtained from Border Leicester x Merino ewes.

of ewes, the wool was classed into standard bins and the weights recorded. From this information, returns at any particular price schedule can be worked out.

## Best Current Financial Returns from Border Leicester x Merino Ewes

In the investigation to compare the Border Leicester x Merino, Dorset Horn x Merino, Corriedale x Merino, and Merino ewes as fat lamb mothers, a line of Merino ewes was divided to provide even flocks for mating separately to Border Leicester, Dorset Horn, and Corriedale rams.

Portion of the ewe progeny of each of these crosses, together with a line of Merino ewes of comparable age, was mated to Dorset Horn rams to give a comparison of the suitability of the different types of ewes as mothers of fat lambs.

Lambing was concentrated and early for all breeds (April–May). Lambs from the Border Leicester half-bred ewes were heavier at birth and generally gave a higher dressed weight and a higher percentage of first-grade carcasses than the lambs from other groups.

There was little difference in the weight of wool from the Merino and the Corriedale x Merino ewes. Both of these groups gave higher returns from wool than the other two groups.

The average results and economic returns are shown in Table 1.

The wool prices were those at the May–June sales of the 1962 wool-selling season, while the lamb values are based on Newmarket prices during early August, 1962. After allowance for transport and selling costs, the prices used were 25d. per lb. for light lambs up to and including 36 lb., 24d. per lb. for medium lambs 37 to 42 lb., and 23d. for lambs over 42 lb.

The highest lamb and gross financial returns were from the Border Leicester

TABLE 1.—COMPARATIVE RETURNS FROM EWES MATED TO DORSET HORN RAMS.

(Based on actual production over eight years, 1942–49, using prices ruling in 1962.—Lamb prices, Newmarket, less freight from Walpeup.)

| | Class of Ewe. | | | |
|---|---|---|---|---|
| | Border Leicester x Merino. | Dorset Horn x Merino. | Corriedale x Merino | Merino. |
| (a) *Wool from Ewe*— | | | | |
| Weight (lb.) | 7·5 | 6·8 | 9·2 | 9·1 |
| Value | £1 11s. 0d. | £1 6s. 6d. | £1 17s. 0d. | £2 1s. 0d. |
| (b) *Average Return from Lambs*— | | | | |
| Chilled Weight (lb.) | 41·4 | 38·8 | 35·8 | 35·1 |
| Percentage First Grade Carcasses | 83 | 81 | 69 | 55 |
| | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| Carcass Value | 4 3 0 | 3 19 0 | 3 13 6 | 3 12 0 |
| Skin Value | 0 14 6 | 0 12 6 | 0 14 0 | 0 13 0 |
| Total Lamb Value | 4 17 6 | 4 11 6 | 4 7 6 | 4 5 0 |
| (c) *Average Return from Ewe*— | | | | |
| Gross Return* | 5 9 0 | 4 19 6 | 5 2 6 | 5 5 0 |

* As the lambing percentage has been less than 100 per cent., the gross return per ewe is less than the total of the average wool and lamb returns.

x Merino half-bred ewes. The heavier fleece from the fine-woolled types did not compensate for the lighter and slower growing lamb.

Most fat lambs produced in the Mallee are marketed while Newmarket prices are above export parity. However, prices based on the Smithfield market in England show the four groups of ewes in the same order as in Table 1, but with lower lamb and gross returns.

### Dorset Horn Most Suitable Ram

In three separate trials, each with a different type of ewe, breeds of rams were compared as sires of fat lambs. In each case, mating time was mid-November.

In the first of these trials, during the 1940 to 1943 lambing seasons, comparisons were made between the wether progeny of strong-woolled Merino ewes mated to Border Leicester, Dorset Horn or Corriedale rams respectively.

The lambing percentages were satisfactory and were about equal in each of the three breeds. In some years, the Border Leicester cross lambs were dropped later than those sired by the other two breeds.

The Dorset Horn cross produced 67 per cent. of first-grade carcasses as against 58 per cent. from the Border Leicester cross and 51 per cent. from the Corriedale cross.

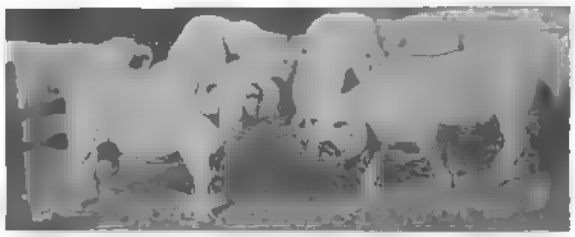
There was no marked difference in the frozen-weight to live-weight ratio between the Dorset Horn cross and the Border Leicester cross, but this ratio was lower in the Corriedale cross.

Observations on the ewe lambs retained for breeding showed that the Border Leicester half-bred lambs developed into the biggest-framed sheep in the following winter, and that the greatest weight of wool, 10·1 lb., was cut from the comeback ewe obtained from the Corriedale–Merino cross.

In the same years the Border Leicester x Merino averaged 9·2 lb., and the Dorset Horn x Merino 8·4 lb.

In 1945, another trial to compare Dorset Horn and Border Leicester rams began. In this case, strong comeback ewes were used instead of Merino. Although both groups were joined at the same time, lambs by the Border Leicester rams were dropped in 1946 about three weeks later, and in 1947 and 1948, about five days later than those by the Dorset Horns.

The Dorset Horn lambs grew slightly faster early in each year and then maintained this lead throughout the season, being some 5 lb. live-weight heavier at slaughter in the first two years, and 2 lb. heavier in the third year. They were also of better quality, as is shown by the percentage of first-grade lambs.



Best results have been obtained from Dorset Horn sires.

In the third trial, conducted for the 1951 to 1955 lambing seasons, the performances of Dorset Horn and Border Leicester rams when used on half-bred Border Leicester x Merino ewes were compared.

In four of the five years, the time of lambing was about equal, but in the other year, it was markedly later for the lambs sired by the Border Leicester rams, and the season finished before all the lambs were fit for market as fats.

When lambing dates were about equal, the lambs by the Dorset Horn rams grew a little faster in the early part of the season, and because of their earlier maturity were suitable for market a little earlier than those by Border Leicester rams.

The lambs sired by Border Leicesters made excellent late growth and, when marketed, had practically caught up to those by Dorset Horns. However, the latter had the added advantage of better conformation as shown by their higher percentage of first-grade lambs. The main results of the three trials are set out in Table 2.

Under the conditions of the experiment, which are typical of a large number of Mallee flocks, the faster, earlier growth and greater percentage of first-grade lambs sired by the Dorset Horn were counterbalanced by the better late growth of the Border Leicester crossbred lambs.

TABLE 2.—SIRE TRIALS.

*Comparative Results from Various Ewe Types.*

| Breed of Ram Used. | Average Weight of Lamb at Birth. | Average Live Weight at Slaughter. | Average Frozen Weight. | First Grade Carcasses. | Average Age at Slaughter. |
|---|---|---|---|---|---|
| | lb. | lb. | lb. | % | (days). |
| *(a) With Merino Ewes—1940-48.* | | | | | |
| Dorset Horn .. .. | .. | 76·4 | 34·1 | 66·9 | 150 |
| Border Leicester .. .. | .. | 76·4 | 34·2 | 57·7 | 157 |
| Corriedale .. .. | .. | 71·2 | 29·6 | 51·1 | 153 |
| *(b) With Comeback Ewes—1946-48.* | | | | | |
| Dorset Horn .. .. .. .. | 11·2 | 83·3 | 40·1 | 84 | 126 |
| Border Leicester .. .. .. .. | 10·6 | 79·4 | 37·7 | 62 | 121 |
| *(c) With Border Leicester x Merino Half-bred Ewes—1951, 1953-55.* | | | | | |
| Dorset Horn .. .. .. .. .. | 10·8 | 91·0 | 42·9 | 86 | 141 |
| Border Leicester .. .. .. .. .. | 10·8 | 90·0 | 42·0 | 60 | 143 |

Even so, the Dorset Horn has three advantages over the Border Leicester as a sire of fat lambs in the Mallee:

★ The faster early growth of the lambs enables advantage to be taken of the early market.

★ Better conformation of the lamb.

★ More consistent mating behaviour.

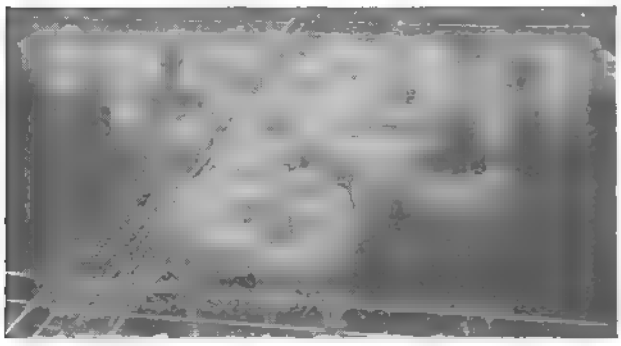
In the only trial in which they took part Corriedale rams were inferior to the British breed as sires of fat lambs.

The Corriedale's main value is as a dual-purpose sheep rather than as a sire of fat lambs.

## Good Type Rams Sired Lambs of Better Conformation

In 1949 and 1950, comparisons were made of lambs sired by Dorset Horn rams of good and of poor conformation. There was no significant difference in the actual weights (live or dressed) of the lambs sired by the various rams, but the good-type rams sired lambs of better conformation, having a higher percentage of first-grade carcasses than those by the poor-type rams.

Of the lambs sired by the "excellent" and the "good" rams 91 and 85 per cent., respectively, were graded first grade, but only 50 per cent. of the lambs by the "poor" rams reached this standard.



High-class fat lambs bred at the Mallee Research Station.

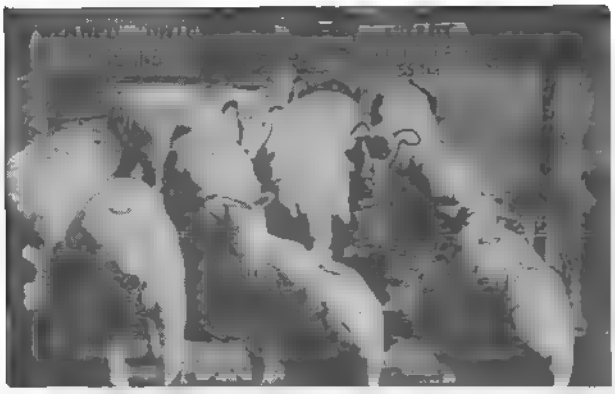
## Early to mid-October Matings for Early Lambs

In 1955, a study was commenced on the practicability of producing very early lambs by early to mid-October matings, using Dorset Horn rams and strong-woolled Merino ewes.

The results show no differences in the percentage of ewes which lambed in any of the time of mating groups, but in 1956 and 1958 the groups mated in late October and mid-November had a more concentrated drop and a higher percentage of twins than those mated earlier in October.

In the 1957 and 1958 mating seasons the use of vasectomized rams (surgically made infertile) for about 2½ weeks before the desired mating time resulted in a much more concentrated drop of lambs, particularly at the earlier mating. (See Table 3).

In the first two years most of the lambs from the early-mated group reached saleable weights and were sold at satisfactory prices at Newmarket at the end of July.



These lambs were weaned at ten to twelve weeks and fattened on lucerne saved for the purpose.

TABLE 3.—TIME OF MATING.

*Use of Teaser Rams with Merino Ewes for Early Lambing, 1958 and 1959.*

| Date of Mating. | Percentage of Ewes Lambed in First Seventeen Days. (Average Two Years.) | |
|---|---|---|
| | Teasers Used. | No Teasers. |
| Mid-October .. .. .. | 74·6 | 56·2 |
| Mid-November .. .. | 67·0 | 62·6 |

In 1958 and 1959, owing to the late break and poor early winter growth of pasture, the lambs were not marketed until the end of August.

## Early Weaning Satisfactory if Lambs on Good Food

Investigational work at other research centres has shown that lambs weaned when about ten to twelve weeks old will continue to grow satisfactorily, provided good quality food is available to them. This indicates the possibility of a variation of management practices when feed is scarce. Such variation would include the weaning of lambs at this age, giving the best grazing available, e.g., green oats or lucerne. The ewes, whose feed requirements are consequently similar to dry sheep, can be placed on poorer feed.

Early weaning trials began at Walpeup in 1959, when extremely dry conditions were experienced. In that year, the growth of lambs weaned on to green lucerne in early June, when they were about ten weeks old, was compared with the growth of similar lambs left on their mothers on short annual pasture plus a small oat grain ration.

In the subsequent years, the grazing available to the two groups was adjusted to compare the growth of lambs weaned on to good saved feed with that of unweaned lambs on poorer feed. For the three years 1959–61, the weaned lambs averaged 84·2 lb. when marketed, their average sale price at Newmarket being £3 14s. The unweaned lambs at the time averaged 81·7 lb., with an average realization of £3 12s. 4d.

Weaned lambs from the early weaning trial.

In 1961, the trial was enlarged to provide additional information concerning the effect of the age of the lamb and the condition of the feed on the comparative performance of weaned and unweaned lambs. The results in that year indicated that, when weaning was done under comparable feed conditions, the lambs on their mothers made better growth than those weaned. Under similar feed conditions, lambs weaned at nine and twelve weeks showed little difference in their rates of growth after weaning.

# LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

## REARING DAY OLD AND STARTED CHICKENS —COMPARATIVE COSTS

The relative merits of whether to rear day old or started stock provide a topical subject whenever poultry farmers meet.

The following calculations were made for a commercial egg producer in a country district of Victoria. The farmer needed five hundred chickens as replacement stock and wanted to know whether it would pay him to buy started stock at fourteen weeks of age or rear day olds.

1. Buying Chickens at Fourteen Weeks of Age

Cost of chickens = £48 2s. 6d. per 100, (9s. 7½d. each).

Freight = £9 7s. 6d. for 500, (4½d. each).

Total cost per 14-week-old chick = 10s. each.

2. Rearing Day Olds

Cost of chicken = £15 per 100, (3s. each).

Feed eaten in first four weeks = approx. 1¼ lb., which, at a feed price of £40 per ton costs 6d. per chick.

Feed eaten from four to fourteen weeks of age would amount to about 11 lb. At the ruling rate for feed costs on this farm the cost would be 2s. 9d. per chick.

Electricity used for brooding would cost about 2d. per chick.

Freight = 1d. per chick.

Total cost per chicken to 14 weeks old is therefore approximately 6s. 6d.

Comparative Costs for 500 Chickens

Started stock at 14 weeks = £250.

Day olds to 14 weeks = £162 10s.

If no losses occurred among the day olds, it would certainly be cheaper to buy them, but there will inevitably be losses in the first fourteen weeks and the estimated cost of these losses must be taken into account. Losses were taken at two levels—2 per cent. and 10 per cent. At a rate of 2 per cent. on 500 day olds, ten chickens are lost and, at a rate of 10 per cent., fifty chickens are lost.

Production on the above-mentioned farm last year was equal to 216 eggs per layer. Using this figure, the loss of potential production from ten birds would be 180 dozen eggs and for fifty birds 900 dozen. The average price which a producer sending all eggs to the Board could expect last year was about 3s. 2d. When this price is applied to the potential production mentioned above, the monetary losses are £28 10s. for a death rate of 2 per cent. and £142 10s. for a rate of 10 per cent.

To the value of potential egg production must be added the value of the birds as culls, in this case estimated to be 7s. per bird, giving a total value of £3 10s. for ten birds and £17 10s. for 50.

The likely cost of feed used to achieve this production must be deducted from the potential returns. At the rate of feed consumption and the cost of feed on this farm, it was estimated to be 25s. per bird, giving a total of £12 10s. for ten birds and £62 10s. for 50.

Therefore the net values of returns lost through deaths are:

For 10 birds (2 per cent.), £28 10s. + £3 10s. less £12 10s. = £19 10s.

For 50 birds (10 per cent.), £142 10s. + £17 10s. less £62 10s. = £97 10s.

The true comparative costs of 500 day olds or started stock are now as follows:—

Started Stock at 14 Weeks, £250.

Day Olds to 14 Weeks of Age—

(*a*) Without losses, £162 10s.

(*b*) With 2 per cent., losses, £162 10s. + £19 10s. = £182.

(*c*) With 10 per cent., losses, £162 10s. + £97 10s. = £260.

Unless losses from day old to 14 weeks are 10 per cent. or greater, it would pay this farmer to buy day old stock. If losses among stock purchased at day old were replaced by started stock, it would certainly be cheaper to brood and rear day olds.

A factor which is strongly in favour of buying day old chickens is the possibility of introducing disease on to the farm through started stock.

The actual figures used in this calculation may not apply to other farms as the cost of of chickens, price paid for feed and rate of lay will vary from farm to farm but they are offered as a guide to farmers who wish to make similar calculations.

[H. A. White, B.Agr.Sc., Agricultural Economics Officer.]

## KEEP WINTER PIGS WARM

These day old pigs have a warm bed and plenty of milk to drink from their mother.

To avoid being understocked in spring when the flush of separated milk comes along, winter farrowed pigs are too valuable to lose. Saving the life of young pigs born this month will pay dividends later when they are weaned and ready to drink that milk.

Many deaths occur shortly after pigs are born because they become cold and hungry or haven't the strength to move out of the way when the sow lies down.

Nature intended a sow to provide the body warmth necessary for the survival of her piglets after birth. Left to their own instincts, most sows, when they have access to suitable material, will build a large, cosy and safe nest before they farrow, and then deliver their pigs in the nest without mishap.

In cold weather, the loss of young pigs after birth can be avoided by retaining the body heat of the sow around them.

An 18-inch wide closely boarded hover, erected across one end of the farrowing shed 10 inches above floor level will help to retain some of the body heat and provide a safety zone for the piglets. An alternative method is to erect a temporary ceiling 3 to 3 ft. 6 in. above floor level across the whole of the sleeping area in the pen and allow the sow to make her nest under this.

If necessary, artificial heat can supplement natural warmth by providing heater units, either gas or electric, to warm the interior of the pen and provide comfort for both the sow and her piglets. Adequate protection must however be provided to prevent these units being interfered with by the sow.

[G. C. Griffiths, D.D.A., Pig Husbandry Adviser).

## MEAT PRODUCTION BUOYANT

The first eight months (July to February) of the present fiscal year has revealed a considerable increase in meat production throughout Australia. Overall meat production for this period was 1,073,000 tons, an increase of 96,000 tons on that for the same period in 1961–62.

In Victoria 325,000 tons of meat was produced and this was 33,000 tons greater than a year earlier. Beef production was up 25,000 tons. Veal, mutton and lamb were all produced in greater quantities. Pig meats showed the only decline but they were

down only by 300 tons. Pig meats also showed a slight decline at the Australian level.

Stock numbers are at record levels in Victoria and, with the dry unfavourable early autumn, there has been heavy marketing of sheep and cattle and, as most of them will be slaughtered, meat production should reach record levels.

The outlet for boneless beef on the American market remains attractive and, as light conditioned cattle are required for this trade, there should be no difficulty in absorbing the extra meat but there may not be much seasonal rise in price this winter. At present, over half of the beef being exported is going to the United States of America. The United Kingdom is still taking most of our surplus lambs but lambs are not available for export at this time of year.

Farmers with adequate fodder reserves should endeavour to hold their stock for sale in August and September. Even if cattle do not gain much in condition, they should gain in total weight and be more valuable. The same would apply to sheep but, in addition, the wool will continue growing and sheep usually have a good sale value in early spring when graziers as well as butchers compete for them.

[A.C.T.H.]

## GUINEA FOWL—SEX DISTINCTIONS

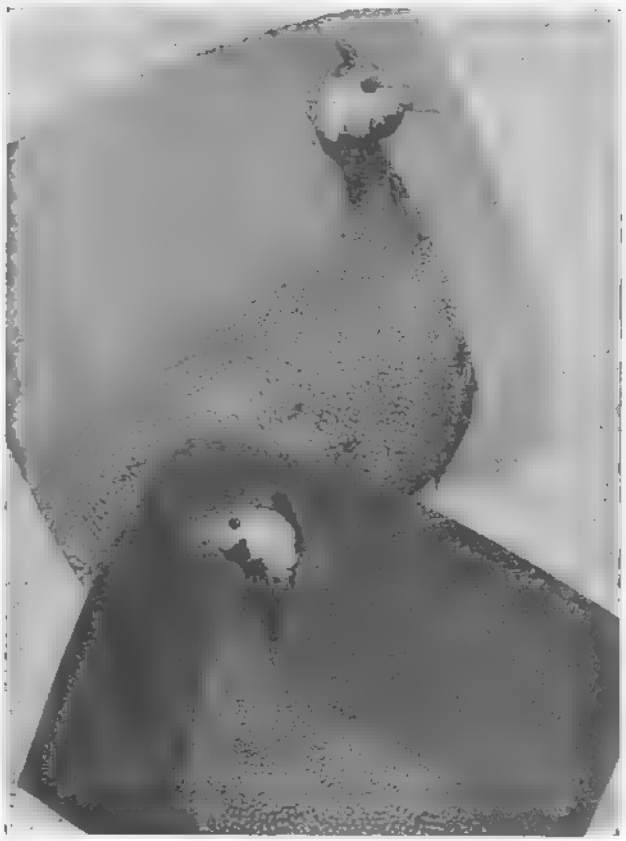
A few guinea fowl are kept in Victoria by those interested in having a few ornamental birds about the place. They may also be kept for sale as meat birds.

Some people like their gamey flavour and consider them a delicacy. The birds weigh about 3½ lb. and carry a good deal of dark coloured flesh on extremely light frames.

From time to time inquiries are received by the Department of Agriculture from persons wishing to determine the sex of adult guinea fowl and, when visiting farms, it is not unusual to find that the farmer cannot distinguish the sexes. Unlike most of our feathered birds there is very little difference in the appearance of the male and female. It is sometimes claimed that the male has a coarser head, with larger helmet (casque) and wattles, but this is not entirely reliable—there is too big a variation.

The most reliable difference is probably their call. The female has a two syllable call which sounds like "Buckwheat" or "Put-rock" and some people think "Comeback" is nearer the sound. The male however has a one syllable shriek. This method of distinguishing the sexes can be used after the birds are about two months old. Even with this method there is some confusion in that both male and female emit one syllable cries when excited.

The guinea fowl, *Numida meleagris*, is related to the turkey, *Meleagris gallopavo*, and sometimes the male will strut in the presence of females in the manner of a turkey gobbler. When the guinea fowl struts, he arches his neck and appears to walk on tiptoe.

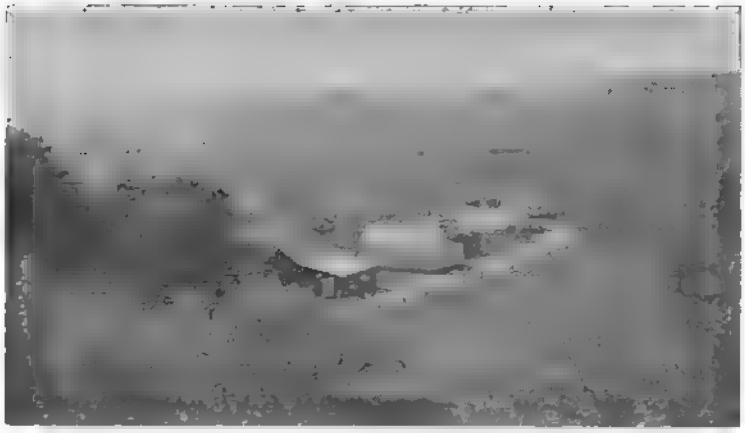


Top, the male guinea fowl, and below, the female.
[*Farmer's Bulletin* 1391, U. S. Dept. of Agric.

[M. R. Barlow, R.D.A. (Reading) Poultry Officer.]

# SUCCESSFUL SHARE DAIRY AGREEMENTS

K. M. Sillcock, B.Agr.Sc.,
Senior Dairy Husbandry Officer



Convenience of working makes for successful share farming. The enterprise should advance the well-being of both parties and allow them to derive satisfaction from the job.

Any legal agreement or business partnership requires a certain amount of goodwill and mutual trust between the parties concerned. If this should give way to doubts, suspicions or even to open enmity there are usually means by which the spirit, if not the letter, of the agreement can be broken. Although these breaches may each be of a petty nature and would not warrant legal action, the cumulative effect of a number of them can be great.

In share dairy farming—perhaps more than in most business arrangements—it is essential that the parties should realise that they must work in harmony and in such a way that their joint efforts contribute to the well-being of both the farm owner and the shareman. If that spirit is absent the shareman can do much to spoil the owner's farm and herd, while, on the other hand, the owner can do a great deal to make life somewhat miserable for the shareman and his family, without specifically violating even the most detailed agreement.

Thus, although a soundly based agreement is in itself a desirable document, it is no guarantee that the partnership will work smoothly. What, then, are the requisites for a workable share arrangement?

A farm which will support only a small milking herd (fewer than 50 cows) will not support a satisfactory share farming business.

## THOROUGH DISCUSSION AT THE OUTSET

Before any agreement is made, whether verbal or written, it is wise for the owner and prospective shareman to make a frank and thorough analysis of the business.

If the property has already been run as a dairy farm, the owner will have figures for costs and returns which can be used as a basis for discussion. If a new dairying business is to be established, the number of milking cows (plus replacement stock) which the farm will carry can be estimated, and from this starting point some forecast of costs and returns can be made.

There are two common types of share arrangement. In one, where the owner supplies all the land, equipment and stock and the shareman contributes mainly labour and managerial skill, the owner commonly receives three-fifths and the shareman two-fifths of the proceeds after deduction of, say, fertilizer and feed costs. But this is not automatically a fair division of the proceeds in arrangements of this type. On one farm the shareman receiving a one-third share, or 6s. 8d. in the £1, may prosper, while on another farm the shareman receiving 8s. in the £1 may be getting less than the current rate of wages for farm labour.

Separate payment should be made to the shareman for any capital improvements he carries out.

Likewise, in the other common type of share dairy farm, on which the shareman may supply the herd, the milking machine and some of the farm plant, half shares may be equitable on some farms, while on others the shareman ought to receive two-thirds or three-fifths of the proceeds.

A frank analysis of costs and returns will disclose, first of all, whether the enterprise is big enough to support a share arrangement at all, If it is, then the pattern of costs can be examined.

The main categories of costs are:

Cash costs, that is, the normal running costs, together with business costs such as shire rates and insurances.

Labour costs, including payment of the share farmer and the owner for any labour they themselves contribute. In this item, some allowance should be made also for the managerial skill they exercise.

Interest on capital invested. Usually the owner has by far the most capital invested in land, plant and stock, but in some arrangements the shareman also has a considerable investment.

Depreciation on capital items. For this to be realistic, it should be based on the current cost of replacing each item, rather than on its initial cost.

If the returns from the business are not likely to be big enough to give to both parties an adequate reward for their labour and management, reasonable interest on their invested capital and sufficient provision for replacement of farm improvements and equipment (depreciation), it is clear at the outset that the attempt at share farming will fail.

When proposing to engage a share farmer the need for such an analysis and discussion of likely costs and returns should be borne in mind—especially by absentee owners with little farming experience.

## TREAT CAPITAL IMPROVEMENTS SEPARATELY

In any business analysis it is essential to distinguish between expenditure on capital equipment and routine costs of running the business. In share farming the distinction is not always clear-cut.

Weed control is a normal part of farming but capital improvement is involved when

weeds are cleared from a previously unused piece of land and a good pasture is established.

Likewise, topdressing is normal practice, but extra fertilizer used in establishing a new pasture on formerly unproductive land may be viewed as capital expenditure. Generally, such improvements enhance the value of the owner's asset, while conferring no immediate benefit on the share farmer. Therefore they should be paid for by the owner, and not charged as a farm running cost to be deducted before profits are divided in the agreed proportion.

## DIVISION OF LABOUR

Closely related to the question of capital and running costs is that of proper division of labour.

The share farmer can expect a direct return only from his routine farm work. If he should do anything in the nature of improving the farm he may reap a return from its enhanced productivity if he stays long enough to do so, but he has no real assurance that this will eventuate. Therefore, it is wise to agree at the outset that he should be paid separately for any farm improvement work he does.

In cases where the owner continues to live and work on the farm, some discussion on the respective portions of the work to be done by each party will make for good understanding later. In some cases, for instance, the shareman does the day to day routine work and the owner undertakes tasks such as weed control and topdressing.

## PERQUISITES

Misunderstandings about the perquisites to which owner and shareman are entitled can cause friction out of all proportion to their real importance; therefore it is wise to discuss these and reach some understanding about them.

Some items in this category are the share farmer's home and garden, household milk supplies, firewood, animals kept as pets, stock kept by the owner in addition to the milking herd and replacements, and use of farm vehicles for combined business and private trips.

Perquisites, even though of small financial significance, should be discussed, since they can otherwise create much misunderstanding.

Another vexatious question on some share farms is that of the week-end visitors brought to the farm by the owner. These visitors—and their children—can sometimes interfere seriously with the share farmer's work, especially by leaving gates open or disturbing the herd at milking time.

## THE NEED FOR FRANKNESS

An owner and shareman who make a practice of examing costs and returns each month—or each time shares are paid over—are less likely to develop suspicions that one party is profiting unduly at the other's expense.

On one share farm where arrangements are most amicable, for instance, a statement of costs, returns and the amount of each share is drawn up each month and signed as an indication that both parties acknowledge this as a correct statement of the financial position.

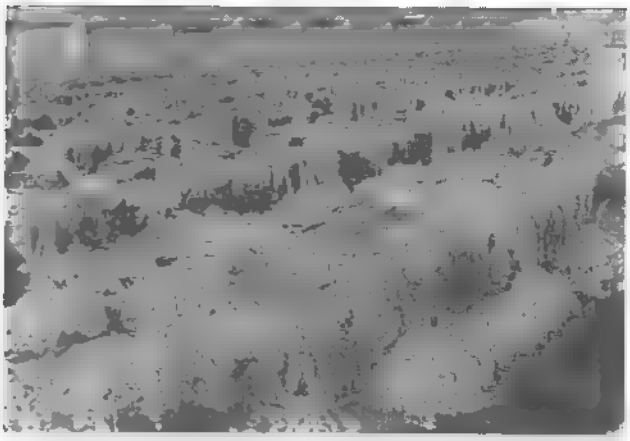
## FURTHER INFORMATION

A circular on Share Dairy Farming, including two specimen share agreements, may be obtained, free of charge, from the Director, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

*Sheep Care in July*

Compiled by P. G. Hyland, B.Agr.Sc.,
Senior Sheep and Wool Officer

# PRODUCING MORE WOOL



A Geelong wool broker's show floor. This selling centre has handled most of the 50 per cent. increase in wool production in the Western District.

The International Wool Secretariat and the newly formed Australian Wool Board have stated that Australia should continue to expand wool production, even in spite of stiffening competition from synthetic fibres. They have expressed confidence that Australia can continue to sell increasing quantities of wool at reasonable prices.

The Victorian Department of Agriculture supports this call for increased wool production. It is economically sound advice and offers a new challenge to Victorian wool producers.

Of all the States in the Commonwealth, Victoria has the greatest potential to expand economic wool production. This capacity has already been well demonstrated in our improved pasture environment since 1945–46. For example in the Western District there was a 50 per cent. increase in wool production between 1950 and 1960.

This is a proud achievement but it is far from the limit of economic possibility. Throughout the improved pasture areas there are vast differences in productivity between farmers with the same apparent potential of land and available resources. There are many economic and personal factors involved in these differences, but basically they are due to management decisions on aspects of pasture establishment and fertilizing, stocking rate, sheep husbandry and fodder conservation. These are the factors which mainly contribute to the observed differences in productivity ranging from 20–25 lb. to 55 lb. of wool per acre and returns to capital investment ranging between 1 to 2 per cent. and 15 to 20 per cent.

The higher levels of output which are being demonstrated as profitable possibilities by a few farmers, require higher inputs in the form of fertilizers, stock, and fodder conservation and the thorough use of farm records and budgets as a guide to management decisions.

There is also need for much more flexibility in thinking about management practices such as timing of operations, for example lambing and shearing; improved grazing and feeding management of the breeding flock; a more rational approach to feeding requirements and fodder conservation based on sound feeding standards and knowledge of sheep requirements; organization of labour and facilities to improve lamb survival; changes in the composition of the flock and perhaps breeding to obtain more income from sheep trading.

These are just a few examples of the factors involved in making management decisions which will lead to higher productivity and profitability. Usually, these management adjustments are complex and several related changes are required to achieve the desired result. Spring lambing improved weaner feeding in summer, reduced total winter feed requirements and improved winter stocking potential are examples. All these changes

may be involved to achieve a higher stocking rate which will have the biggest influence on productivity.

Have you seriously considered any of these management changes in relation to your farm in recent years? If not, now is the time to do it! The need for increased wool production is urgent and it can make you more prosperous as well as your State.

[P.G.H.]

# MANAGEMENT FOR WINTER LAMBING

Winter lambing—particularly for fat lamb production—is common in the mid- and late-season districts, such as parts of the Central Highlands and the Timboon area. This gives a high percentage lamb drop and allows ample time for the growth and finishing of the lamb before the season "cuts out". One of the principal disadvantages of winter lambings in Victoria is the difficulty in providing sufficient food for the ewes in late pregnancy or with lambs at foot.

The nutrition of the ewe over the last six weeks of pregnancy is critical. The lamb foetus doubles its weight in this period, resulting in a heavy drain on the ewe. If under-nutrition occurs this can lead to:—

* Reduced wool cuts;
* Pregnancy toxaemia;
* Increased susceptibility to disease and worms;
* Poor milk supply and mothering ability.

The resultant lamb drop will be affected by:—

* Reduced size, weight, and energy reserves at birth;
* Poorer chances of survival;
* Greater variation of size in the lamb drop;
* Lower value as a fat lamb for slaughter at 12 to 16 weeks or lower productivity as an adult sheep.

### Hand Feeding Management

The aim should be to maintain ewes in strong store condition during late pregnancy.

Some supplementary feeding may be needed. However, over feeding is wasteful, and over-fat ewes can also have small, weak lambs. It should also be kept in mind that economic advantage from feeding supplements to grazing sheep is likely to be obtained only when the pasture feed is very short and the supplement is necessary to prevent serious loss of production or deaths which you know from experience would occur without the feed.

Good quality grass or cereal hay, or cereal grains can be used for this purpose. The choice depends on the availability and cost. Cereal grains such as oats are a good supplement, as they have a high feed value for minimum bulk.

If whole wheat is used, care must be taken to introduce it very gradually. Between 1 and 2 oz. per head per day should be fed at the start and the full ration built up over two weeks.

Oat grain fed in troughs is a good supplement for lambing ewes on very short grazing feed.

Rations will depend on the paddock feed available. On bare paddocks in cold weather 1¼ to 1½ lb. per head per day would be needed. Wheat can be used at 4/5th the rate for oats.

Good quality clover or lucerne hay may be used but poor quality hay is unsatisfactory because the ewes cannot eat enough to meet their needs.

Daily feeding is best for pregnant ewes.

### Grazing Management

Where grass is very short, a rotation system with paddock changes at seven- to ten-day intervals and involving at least three or four paddocks is beneficial. The ewes should be drenched first to reduce their worm burden.

This system of rotation should be discontinued once the pasture begins to "come away" and get ahead of the ewes and lambs. Set stocking of ewes and lambs with adjustments to stocking rate to keep pace with the rate of pasture growth is the best system of grazing management throughout the spring.

Late paddocks, such as southern slopes and creek flats can be reserved for finishing lambs when the other paddocks have dried off.

### Saving Winter Lambs

Starvation and exposure can take heavy toll of new-born lambs in winter. These two are closely related and one can intensify the effects of the other.

Starvation may be caused by :—

* Abandonment or rejection of lamb by ewe, or vice versa (especially when a lamb is one of twins).

* Weakness at birth (accentuated by exposure to cold);

* No milk or thick milk.

Faulty milk supply by the ewe may be caused by poor nutrition or damage to the udder caused by mastitis or shearing cuts. Checking udders at mating or after shearing is essential if these losses are to be avoided. Small lambs have lower energy reserves and will succumb quicker than normal lambs in a flock. A good drink of milk greatly reduces the dangers from exposure.

Lambing in sheltered paddocks also reduces loss from exposure—trees, hedges, stone walls, tussocks and the lee side of hills all play their part.

Pre-lambing shearing will encourage ewes to seek shelter. With careful handling ewes can be shorn within two weeks of the commencement of lambing. Rough handling and prolonged shedding may lead to lambing difficulties such as pregnancy toxaemia ("Twin Lamb disease") and hypocalcaemia ("Milk Fever"), particularly in ewes carrying twins or in poor condition.

Pre-lambing shearing (or crutching) helps new-born lambs find the udder for their first drink.

### Foot Rot

Foot rot places a heavy burden on lambing ewes and young lambs, and for this reason should be controlled in the summer and autumn. However, if an outbreak does occur it can be kept in check by twice-weekly formalin foot-bathing using a portable foot-bath and yards in the paddock. In a rotation system they can be foot-bathed from one paddock to the next.

A portable foot-bathing unit is very useful to treat a winter outbreak of foot rot in lambing ewes.

[Ian R. Thomas, B.Agr.Sc., District Sheep and Wool Officer, Warrnambool.]

# THE COMMUNITY-OWNED RESEARCH AND DEMONSTRATION FARM

## *Its Value as an Extension Medium*

K. R. Garland, M.Agr.Sc., District Irrigation Officer and F. J. Barkla, B.Agr.Sc., Agricultural Extension Officer

*The Department of Agriculture has associated with the four community-owned research and demonstration farms which have been established in Victoria, at Woorinen (1931), Swan Hill (1954), Kerang (1956) and Maffra (1961). All of these farms are irrigation properties and their principal interests, respectively, are horticulture, pastures and dairying, pastures and sheep, and pastures and dairying.*

*The authors have been associated with the Swan Hill and Kerang projects only. The following remarks, therefore, apply solely to these two farms. Another reason for grouping the two farms is that very similar systems of management have been adopted in each instance, whereas at Woorinen and Maffra, the projects differ from the other two in several important aspects.*

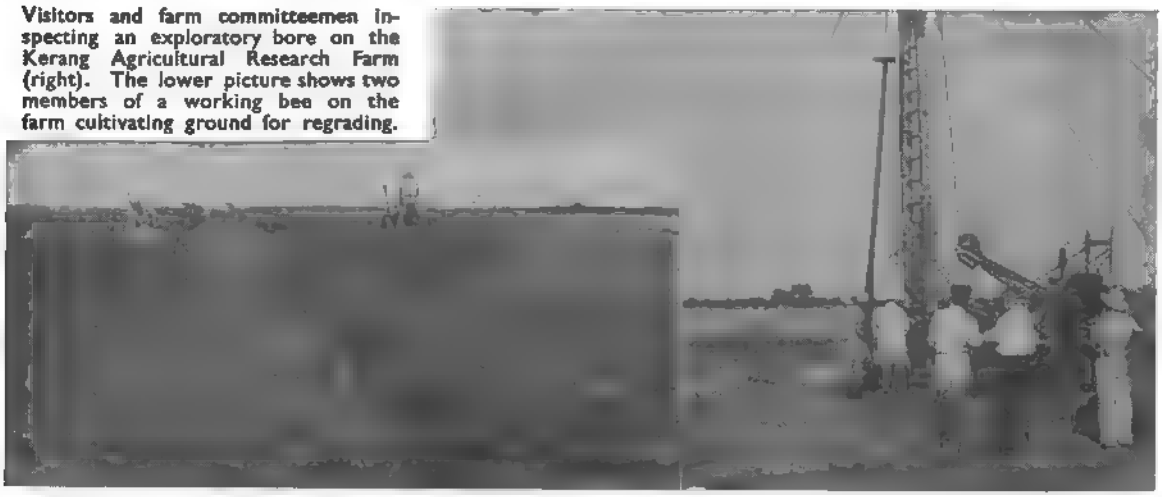
### Objects of Community-owned Research Farms

1. To demonstrate efficient methods of irrigation farming.
2. To investigate problems associated with the irrigation, growth and utilization of pastures and fodder crops.

### Membership.

Membership to either farm is secured by payment of a fee of £2 per annum. In addition, at Kerang, £20 secures life membership. At present there are 150 members at Swan Hill and 260 at Kerang. Nearly half of the members at Kerang are enrolled for life. The existence of such a life-member category has two clear advantages:

1. It produces a useful amount of money at the start of the project when, naturally, finance is required quickly. Thus, at Kerang, the life membership subscriptions of 100 persons greatly assisted towards the purchase price (£3,100) of the property.



Visitors and farm committeemen inspecting an exploratory bore on the Kerang Agricultural Research Farm (right). The lower picture shows two members of a working bee on the farm cultivating ground for regrading.

Sheep husbandry officers, Messrs. P. Hyland and B. McConchie at a recent Kerang field day. Mr. McConchie controls all sheep husbandry trials on the farm.

2. It results in the formation of a group of members certain to offer sustained interest in the farm.

MANAGEMENT.

Each farm has a *general committee* elected by members, and this committee is of fifteen persons at Swan Hill, and 21 at Kerang. The fact that this committee includes not only farmers, but businessmen, bank managers, stock agents and journalists, assists greatly in the effective operation of the group. In each case this committee has direct control of all the activities of the farm, with the exception of the research projects referred to later in this paper.

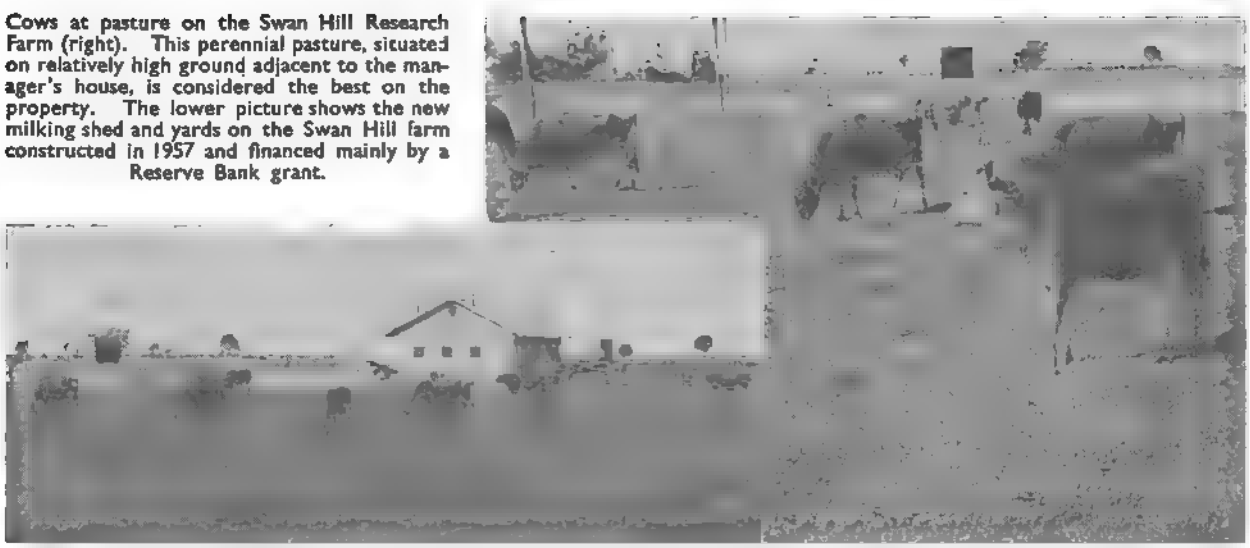
Sub-committees are formed from time to time to attend to specific matters such as the arrangement of field days, or to supervise the construction of a building, but doubtless the principal sub-committee is the *farm management sub-committee*, consisting of five persons at Swan Hill, three at Kerang. On each farm, the major decisions of the general committee concerning farm management are carried out by this sub-committee. Each farm has a resident manager instructed by the farm management sub-committee.

## Technical Advisory Committees

Technical advisory committees have three main functions—

1. To advise the general committees on technical matters.
2. To carry out and co-ordinate research projects.

Committeemen J. Le Sueur and B. Drummond in an experimental tree plantation on the Kerang Farm (left). More than 50 varieties of trees have been tested under the supervision of the Natural Resources Conservation League, on the farm. The manager's new residence is pictured in the background. On right, farm committeemen selling trees of proven varieties at the Kerang field day last year. A total of 800 seedling trees of the twelve varieties found to do best on the farm, were sold.



Cows at pasture on the Swan Hill Research Farm (right). This perennial pasture, situated on relatively high ground adjacent to the manager's house, is considered the best on the property. The lower picture shows the new milking shed and yards on the Swan Hill farm constructed in 1957 and financed mainly by a Reserve Bank grant.

3. To demonstrate the new techniques developed by research.

The technical committees comprise representatives of the Department of Agriculture (Agricultural and Live Stock Divisions, and State Laboratories), the Commonwealth Scientific and Industrial Research Organization, the State Rivers and Water Supply Commission, the University of Melbourne (Kerang only), and local irrigators' organizations.

Research and experimental projects already commenced cover a wide range of subjects such as salt-land reclamation, land drainage, frequency of irrigation, fertilizer use, control of channel weeds, pasture mixtures, sheep mating and lamb growth rates, and tree plantations.

## Finance

Finance is obtained from the following sources :

1. Membership Subscriptions :

Members' subscriptions are not now a large source of revenue, since even as many as 150 annual members subscribe only £300 each year. The initial life membership subscriptions were however, very useful at Kerang, as mentioned previously.

2. Income from Farm Operations :

It is hoped, eventually, that this income on both farms will exceed the manager's salary. This has already been achieved at Swan Hill where 25 milking cows are carried. At Kerang, 420 ewes are run, but this flock will gradually be increased during the next three to four years.

3. Grants :

(*a*) The Reserve Bank of Australia has made grants for use on both farms for several years, the size of the grant varying from £250 to £2,000 per annum.

(*b*) The State Government, through the Minister for Agriculture, has made grants of £1,000 to each farm. These grants have enabled new houses to be constructed on the two farms. Further, at Swan Hill, grant money has been used to build a milking shed, install drains and purchase a tractor.

Maternal contentment in the pig pen at the Swan Hill Research Farm. The pig herd at the farm is maintained at a minimal level of disease.

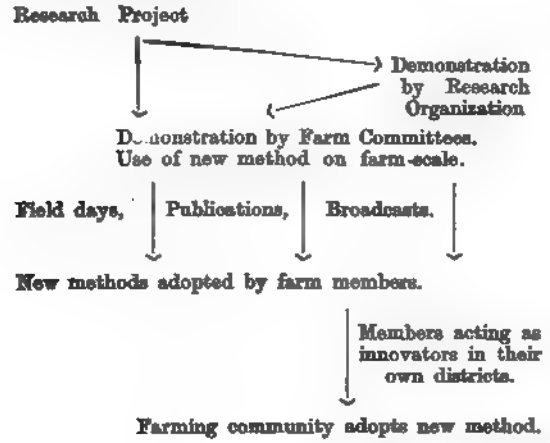
Liquid manure from the Swan Hill Research Farm dairy shed is collected in a concrete sump and distributed on to pastures from this tank.

4. DONATIONS :

Donations of goods, live stock or services are commonly made. Items donated to the Kerang farm include flock rams, feed oats, hay, dam and channel installations, internal road formations (Shire) and irrigation water (State Rivers and Water Supply Commission). Each research project is financed by the particular Government Department concerned.

## Role of Community-owned Research Farms in Extension Services

The diagram below illustrates the sequence by which it is expected new and improved farming methods, discovered or demonstrated on these farms, will be adopted by the farming community.




In addition to the spreading of ideas as indicated above (these ideas are created or displayed on the farm), the farm committees also foster the introduction of "external" ideas through the presentation of talks by eminent agricultural or veterinary authorities at annual meetings, field days and evening lectures.

The managements of the new research farms at Swan Hill and Kerang deserve much credit for the fact that there are now six resident and four visiting research officers working on the farms where, only six years ago, one officer resided and worked. However, attempts by the management of the Kerang farm for the establishment of more adequately staffed and equipped research laboratories at Kerang have not yet borne fruit.

Some local criticism of the community-owned research farm system might stem from the fact that at best only half of the irrigators in the Kerang–Swan Hill area are subscribers. However, it will always be true that a percentage of the community is prepared to accept benefits from a system to which it has not contributed. Nevertheless, membership drives are held from time to time, and these always recruit some new members. The farm committees are fully aware that the strength of the farm is in the strength of the membership, and they take every opportunity to increase it.

Probably 20 to 30 years must pass before the degree of success of these two community-owned properties can be gauged, but at present there are three good reasons for optimism :

1. The continued success and prosperity of the farm at Woorinen, now 31 years old ;
2. The formative years, when so much needed to be done, but when finance was most limiting, have been successfully negotiated ;
3. The development of new and useful methods as a result of the current research program.

# CARCASS APPRAISAL

## *Simple System used by Department of Agriculture*

A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

**Carcass appraisal is the best method of judging carcasses at exhibitions and for recording the quality of carcasses in a standard form which can be referred to at later dates.**

**Carcass appraisal systems were discussed in the May 1960 issue of this Journal. Since then, more information has become available and this has been used to compile a more simple and more accurate system of appraisal.**

**Although no appraisal system will be perfect, many take too long to perform and deal with features having little bearing upon carcass quality.**

The appraisal does not take into account the rate of growth of the beast producing the carcass, the food consumed per pound live weight gain or the total commercial value of the carcass. It does, however, give a measure of the quality of the carcass as determined by the proportion of lean meat to fat and bone, and of the popular high-priced cuts to the poor low-priced ones.

For two years, the Department of Agriculture has appraised carcasses by a simple system worked out by the writer—who had data of several hundred carcasses dating back to 1950—and Mr. R. D. McKellar, Works' Superintendent of the Victorian Inland Meat Authority. In this system maximum points are allotted for four features as follow :—

| | Pts. |
|---|---|
| A. By Measurement | |
| 1. Eye muscle area (approx.) | 40 |
| 2. Fat cover over eye muscle | 30 |
| 3. Leg length .. .. | 20 |
| B. By Eye Judgment | |
| 4. Fat distribution and general appearance .. .. | 10 |
| | 100 |

This system is simple and more accurate than other systems used. It can be carried out—without greatly interfering with the

Measuring the eye muscle of a good, well proportioned carcass.

routine of abattoir operations—in about half the time of the New Zealand system which allots points for ten features.

### Muscle Development

The two most important features of a carcass are its muscle development and the fat cover. The amount of muscle in the eye of meat (A1) where the carcass is quartered between the 10th and 11th ribs, is a good measure of the meatiness of the carcass. To assess this, the depth and breadth of the eye muscle are measured and multiplied together to obtain the approximate area. There are means of measuring the area of the eye muscle more accurately, but they are time consuming and the differences between the approximate areas and the actual areas are insufficient to have practical bearing upon the final result. Formerly, only the depth of muscle was measured and in the majority of carcasses this single measurement was sufficient; however, it was contended that it favoured carcasses from particular breeds which had deep but narrow muscles, whereas carcasses from breeds with more shallow but broad muscles were meatier. By measuring both depth and breadth this argument is eliminated. The consumer demand is for meaty carcasses and the greater these measurements in relation to the weight of the carcass the better.

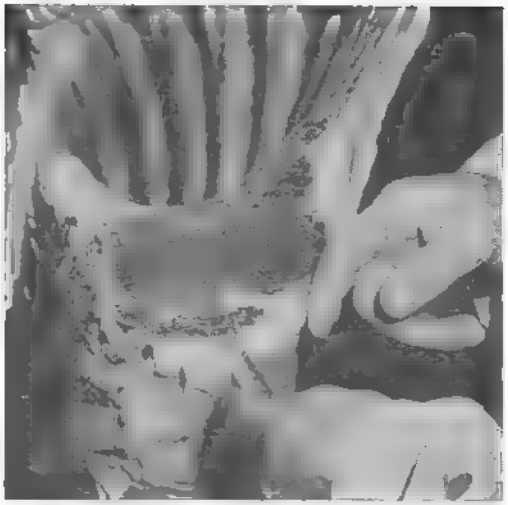
### Fat Cover

The second most important feature of the carcass is the amount of fat (A2) in it. A good carcass must have just sufficient fat. Nobody wants too much fat and meat with too little fat is not favoured. The depth of fat is measured in two places on each side of the carcass to obtain a fair average depth. An ideal depth of fat is sought. Carcasses lose points for having too much or too little fat. The tendency is for less fat than formerly, when carcasses with half an inch or even more cover of fat were popular. To-day the demand is growing for carcasses with as little as one quarter of an inch of fat.

### Leg Length

Although 20 points are given for shortness of leg (A3) there is some controversy as to whether such a high score for this feature is justified. A short leg in relation to the weight is said to indicate a thick carcass. Unfortunately, this feature does favour over-fat carcasses, and carcasses with heavy kidney, channel and cod fat, but such carcasses usually lose heavily for insufficient muscle and too much fat.

A study of available information suggests that this feature could be eliminated and appraisal based upon the remaining features without upsetting the system.



Measuring the fat cover over the eye muscle. The second measurement is made one inch from the other end of the eye muscle.

### Fat Distribution and General Appearance

The fourth feature—fat distribution and general appearance (B4)—is an open one combining many individual features such as uneven distribution of fat over the carcass, too much or too little fat, soft fat, yellow fat, too much kidney, channel or cod fat, heavy briskets and shoulders, poor hind quarter development, dark flesh, or any other feature likely to detract from the quality of the carcass. A maximum of 10 points is considered sufficient for all these qualities, and when assessing the points, the whole 10 could be deducted for poor distribution of fat over the carcass if desired.

When appraising carcasses, any carcass which the appraiser considers not to be a first grade one should be disqualified, and if weight limits are to be imposed, a penalty of 1 point for each 20 lb. for which the carcass is outside the weight range may be imposed. A maximum of 5 points penalty is recommended.

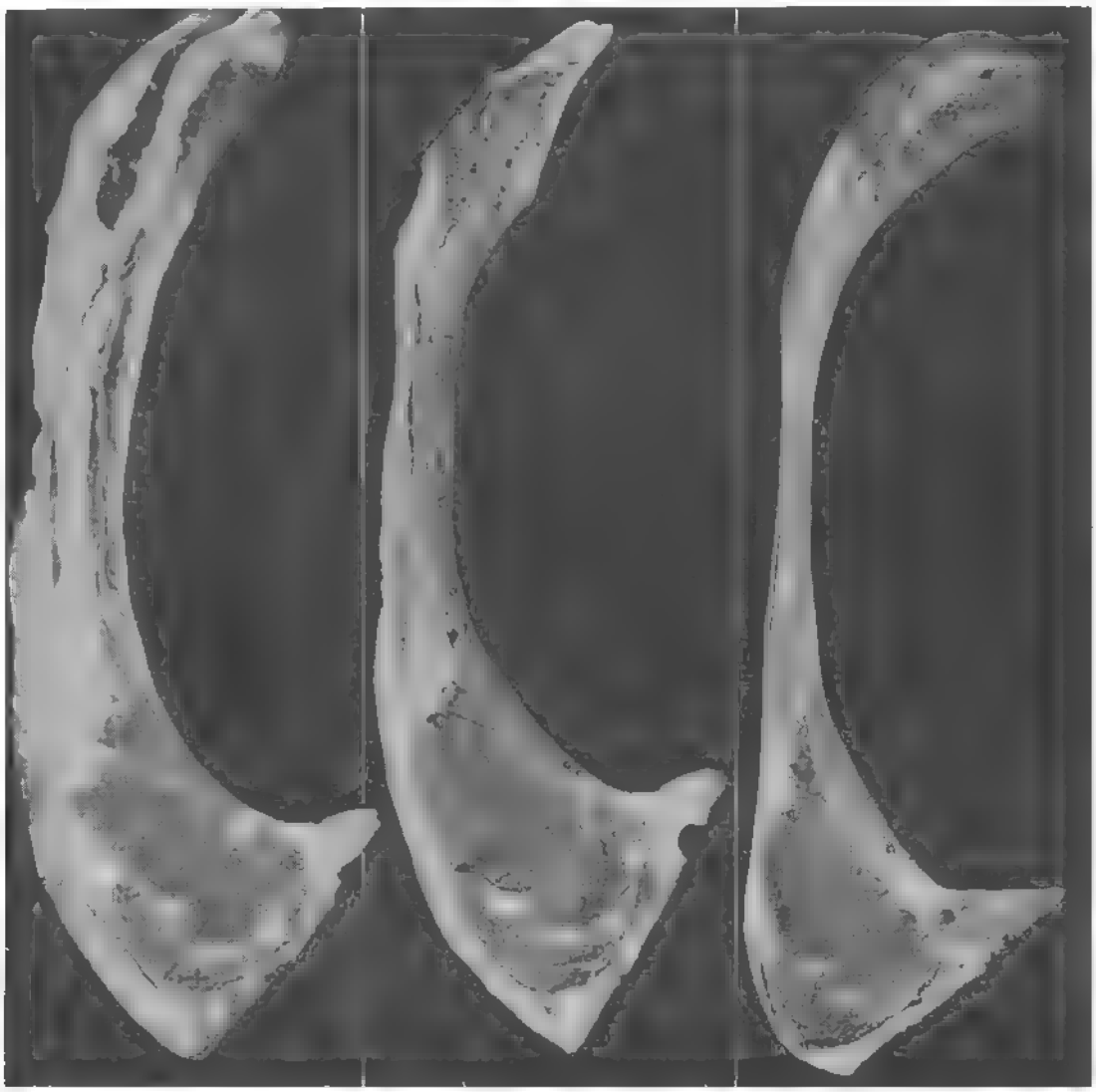
Some of the missing features of the New Zealand system are incorporated in the feature for General Appearance, others such as " Balance of Carcasses " and " Marbling " have been dropped.

The feature, " Balance of Carcass ", favours those carcasses with heavy unwanted kidney, channel and cod fat. It does not necessarily discriminate these carcasses with thick meaty hind-quarters and light briskets and necks.

Marbling is a feature associated with carcasses from aged, overfat bullocks. The young steers, under two years old, which produce most of today's beef have little marbling. Consumers do not take marbling into account when purchasing beef and research has shown no relationship between marbling and tenderness or palatability.

## Appraising the Carcass

When appraising carcasses the co-operation of the staff at the abattoirs is essential and the details should be discussed beforehand with the works manager. The animals should be identified and the identity tagged



Three cut surfaces showing varying eye muscle, fat cover over eye muscle and proportions of muscle to fat. The cut, left, is much too fat and shows poor muscle development. The cut, centre, is nearly ideal, while the cut, right, is on the thin side.

or branded on each side of each carcass as soon as the hide is removed. Weights should also be tagged on to the sides of the carcasses. The carcasses should be chilled as quickly as possible.

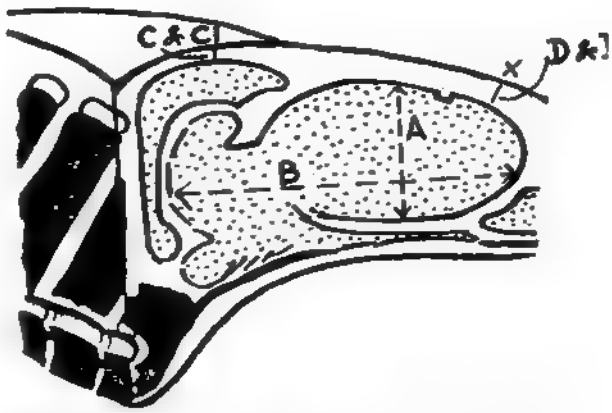
It is an advantage to leave the spaces between the sides of the carcasses a little wider than usual and to leave a rail free between every two rails of carcasses. Carcasses could be hung on the 1st, 3rd, 4th 6th, 7th, 9th rails and so on, leaving the 2nd, 5th and 8th rails free. Good light is required in the chiller.

The following morning the carcasses should be chilled and ready for appraisal.

The appraiser firstly assesses the points for fat distribution and general appearance, by examining each side in turn. He should give his maximum score out of ten points for each carcass, but later when the carcasses are quartered he may decide to deduct points for features not obvious when examining the whole sides. The leg lengths are then measured from the fat selvedge in the crutch to the prominence on the inside of the hock indicating the end of the tibia.

The sides are then quartered between the 10th and 11th ribs. When quartering, the knife should be held horizontally and the cut made midway between the ribs rather than along the edge of one of them. The fore-quarter is left hanging onto the hind. Measurements are then made of the eye muscle and fat covering it. Both sides are measured. This overcomes variations brought about by:—(1) in skinning when fat may be removed on the hide, as the removal of fat penalizes a thin carcass, but assists a fat one and (2) in cutting or sawing the carcasses into halves. The spines of the vertebra are too thin to cut in half and they are usually on one side or the other. On the side with no spines to hold the muscle and fat in position, the cut surface is pulled out of shape as the fat cools and shrinks. The average width and average breadth of the two eye muscles are multiplied together to arrive at the approximate area of the eye muscle. The depth of fat is measured about one inch from each side of both eye muscles. For computing the points, from Table II. the four measurements are added together.

The accompanying diagram shows where the measurements are taken:




Posterior end of forequarter. A is the depth and B the width of the eye muscle. C and D are the depth of fat on one side. C1 and D1 are shown to represent the depth of fat on the other forequarter.

Score cards can be printed as follows:—

CARCASS COMPETITION.

SCORE CARD.

Entry No._____ Class No._____

Exhibitor _____

Breeding of Steer/Heifer _____

Date of Birth _____

Chilled Weight of Carcase, _____ lb.

Live Weight of Steer _____

| — | Possible points. | Standard measurements for carcass this weight. | Actual Measurements. | Points gained. |
|---|---|---|---|---|
| *Appraisal of Carcass by Measurement.* | | | | |
| Eye Muscle .. | 40 | | | |
| Fat Cover .. | 30 | | | |
| Leg Length .. | 20 | | | |
| *By Inspection.* | | | | |
| Fat Distribution and General Appearance | 10 | | | .. |
| Carcass—Total .. | 100 | | | .. |
| Weight Penalty .. | .. | .. | .. | .. |
| | | Net Total .. | .. | .. |

Date of Competition _____ Place in Competition _____

The tables at present used for converting measurements to points are shown in the following pages.

## Table 1.—Table from which Points for Fullness of Meat (Eye Muscle Depth x Eye Muscle Width) are Allotted.

| Points | 40 | 38 | 36 | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chilled Weight lb. | Approximate Eye Muscle Area (Depth x Width) in square centimetres. | | | | | | | | | | | | | | | | | | | | |
| 251–275 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 48 | 46 | 44 | 42 | 40 | 38 |
| 276–300 | 79 | 77 | 75 | 73 | 71 | 69 | 67 | 65 | 63 | 61 | 59 | 57 | 55 | 53 | 51 | 49 | 47 | 45 | 43 | 41 | 39 |
| 301–325 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 48 | 46 | 44 | 42 | 40 |
| 326–350 | 81 | 79 | 77 | 75 | 73 | 71 | 69 | 67 | 65 | 63 | 61 | 59 | 57 | 55 | 53 | 51 | 49 | 47 | 45 | 43 | 41 |
| 351–375 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 48 | 46 | 44 | 42 |
| 376–400 | 83 | 81 | 79 | 77 | 75 | 73 | 71 | 69 | 67 | 65 | 63 | 61 | 59 | 57 | 55 | 53 | 51 | 49 | 47 | 45 | 43 |
| 401–425 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 48 | 46 | 44 |
| 426–450 | 85 | 83 | 81 | 79 | 77 | 75 | 73 | 71 | 69 | 67 | 65 | 63 | 61 | 59 | 57 | 55 | 53 | 51 | 49 | 47 | 45 |
| 451–475 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 48 | 46 |
| 476–500 | 87 | 85 | 83 | 81 | 79 | 77 | 75 | 73 | 71 | 69 | 67 | 65 | 63 | 61 | 59 | 57 | 55 | 53 | 51 | 49 | 47 |
| 501–525 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 | 48 |
| 526–550 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 | 50 |
| 551–575 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 | 52 |
| 576–600 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 | 54 |
| 601–625 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 | 56 |
| 626–650 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 | 58 |
| 651–675 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 | 60 |
| 676–700 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 | 62 |
| 701–725 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 | 64 |
| 726–750 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 | 66 |
| 751–775 | 108 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 | 68 |
| 776–800 | 110 | 108 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 | 70 |
| 801–825 | 111 | 109 | 107 | 105 | 103 | 101 | 99 | 97 | 95 | 93 | 91 | 89 | 87 | 85 | 83 | 81 | 79 | 77 | 75 | 73 | 71 |
| 826–850 | 112 | 110 | 108 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 | 72 |
| 851–875 | 113 | 111 | 109 | 107 | 105 | 103 | 101 | 99 | 97 | 95 | 93 | 91 | 89 | 87 | 85 | 83 | 81 | 79 | 77 | 75 | 73 |
| 876–900 | 114 | 112 | 110 | 108 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 | 74 |
| 901–925 | 115 | 113 | 111 | 109 | 107 | 105 | 103 | 101 | 99 | 97 | 95 | 93 | 91 | 89 | 87 | 85 | 83 | 81 | 79 | 77 | 75 |
| 926–950 | 116 | 114 | 112 | 110 | 108 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 | 76 |
| 951–975 | 117 | 115 | 113 | 111 | 109 | 107 | 105 | 103 | 101 | 99 | 97 | 95 | 93 | 91 | 89 | 87 | 85 | 83 | 81 | 79 | 77 |
| 976–1,000 | 118 | 116 | 114 | 112 | 110 | 108 | 106 | 104 | 102 | 100 | 98 | 96 | 94 | 92 | 90 | 88 | 86 | 84 | 82 | 80 | 78 |

## TABLE 2.—FAT COVER—DEPTH OVER EYE MUSCLE—THE SUM OF C, $C_2$, D, and $D_1$, MAXIMUM 30 POINTS.

(Measurements in Millimetres.)

| | Points—Too Thin. | | | | | | | | | | | | | | Ideal. | Points—Too Fat. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Points .. .. .. .. | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 |
| Carcass Weight (lb.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 300 and Under .. .. .. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| 301–325 .. .. .. .. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 24 | 26 | 28 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
| 326–350 .. .. .. .. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 22 | 24 | | 28 | 30 | 32 | 34 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 |
| 351–375 .. .. .. .. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 376–400 .. .. .. .. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| 401–425 .. .. .. .. | 10 | 11 | 12 | 13 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 33 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 55 | 56 | 57 | 58 |
| 426–450 .. .. .. .. | 10 | 11 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 33 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 61 | 62 |
| 451–475 .. .. .. .. | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 53 | 56 | 58 | 60 | 62 | 64 | 66 |
| 476–500 .. .. .. .. | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 |
| 501–525 .. .. .. .. | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 |
| 526–550 .. .. .. .. | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 |
| 551–575 .. .. .. .. | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 |
| 576–600 .. .. .. .. | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 |
| 601–625 .. .. .. .. | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 |
| 626–650 .. .. .. .. | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 |
| 651–675 .. .. .. .. | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 |
| 676–700 .. .. .. .. | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 |
| 701–725 .. .. .. .. | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 |
| 726–750 .. .. .. .. | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 |
| 751–775 .. .. .. .. | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 |
| 776–800 .. .. .. .. | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 |
| 801–850 .. .. .. .. | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 |
| 851–900 .. .. .. .. | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 | 96 |
| 901–950 .. .. .. .. | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 | 96 | 98 |
| 951–1,000 .. .. .. | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 | 96 | 98 | 100 |

TABLE 3.—HOW THE ALLOTMENT OF POINTS FOR BLOCKINESS—LENGTH OF LEG IN CRUTCH—IS MADE.

*(Length from Point of Tibia to Fat Edge in H-bone Line.)*

Maximum, 20 Points.

| Points .. .. | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Carcass Weight (lb.). | Measurements in Inches. | | | | | | | | | |
| 450–475 .. .. .. | 12⅝ | 13⅛ | 13⅝ | 14⅛ | 14⅝ | 15⅛ | 15⅝ | 16⅛ | 16⅝ | 17⅛ |
| 476–500 .. .. .. | 13 | 13⅜ | 14 | 14⅜ | 15 | 15⅜ | 16 | 16⅜ | 17 | 17⅜ |
| 501–525 .. .. .. | 13⅛ | 13⅝ | 14⅛ | 14⅝ | 15⅛ | 15⅝ | 16⅛ | 16⅝ | 17⅛ | 17⅝ |
| 526–550 .. .. .. | 13⅜ | 14 | 14⅜ | 15 | 15⅜ | 16 | 16⅜ | 17 | 17⅜ | 18 |
| 551–575 .. .. .. | 13⅝ | 14⅛ | 14⅝ | 15⅛ | 15⅝ | 16⅛ | 16⅝ | 17⅛ | 17⅝ | 18⅛ |
| 576–600 .. .. .. | 14 | 14⅜ | 15 | 15⅜ | 16 | 16⅜ | 17 | 17⅜ | 18 | 18⅜ |
| 601–625 .. .. .. | 14⅛ | 14⅝ | 15⅛ | 15⅝ | 16⅛ | 16⅝ | 17⅛ | 17⅝ | 18⅛ | 18⅝ |
| 626–650 .. .. .. | 14⅜ | 15 | 15⅜ | 16 | 16⅜ | 17 | 17⅜ | 18 | 18⅜ | 19 |
| 651–675 .. .. .. | 14⅝ | 15⅛ | 15⅝ | 16⅛ | 16⅝ | 17⅛ | 17⅝ | 18⅛ | 18⅝ | 19⅛ |
| 676–700 .. .. .. | 15 | 15⅜ | 16 | 16⅜ | 17 | 17⅜ | 18 | 18⅜ | 19 | 19⅜ |
| 701–725 .. .. .. | 15⅛ | 15⅝ | 16⅛ | 16⅝ | 17⅛ | 17⅝ | 18⅛ | 18⅝ | 19⅛ | 19⅝ |
| 726–750 .. .. .. | 15⅜ | 16 | 16⅜ | 17 | 17⅜ | 18 | 18⅜ | 19 | 19⅜ | 20 |
| 751–800 .. .. .. | 15⅝ | 16⅛ | 16⅝ | 17⅛ | 17⅝ | 18⅛ | 18⅝ | 19⅛ | 19⅝ | [illegible] |
| 801–850 .. .. .. | 16 | 16⅜ | 17 | 17⅜ | 18 | 18⅜ | 19 | 19⅜ | 20 | [illegible] |
| 851–900 .. .. .. | 16⅛ | 16⅝ | 17⅛ | 17⅝ | 18⅛ | 18⅝ | 19⅛ | 19⅝ | 20⅛ | 20⅝ |
| 901–950 .. .. .. | 16⅜ | 17 | 17⅜ | 18 | 18⅜ | 19 | 19⅜ | 20 | 20⅜ | 21 |

# Certified Pullorum-Tested Poultry Flocks

A certified pullorum-tested flock is one in which all stock over four months of age has given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca; K. Legbar; L. Turkeys; M. New Hampshire; N. Plymouth Rock; O. Indian Game; P. Ancona; Q. Blue Leghorn; R. Andalusian; S. Bantams; T. Meat Type.

| Owner. | Breed. | Number of Birds. |
|---|---|---|
| Ashton, C. and E., Warrandyte South .. | A, B | 619 |
| Athel Park Poultry Farm, Box 62, Mooroopna | B | 1,946 |
| Baldwin, H. B., 384 Dorset-road, Boronia .. | A, T | 430 |
| Bambery, G., Chickadee Hatchery, Rockbank | A, B, T | 2,442 |
| Berry, F. W., 37 Hillcrest-grove, Springvale | A, B | 517 |
| Broadhurst, W. and G., Frankston-road, Cranbourne | A, B | 1,642 |
| Caligari, P., 50 Holyrood-street, Maryborough | A, B | 990 |
| Casson, D., 20 Avoca-crescent, Pascoe Vale | A, B | 3,366 |
| Cavanagh, J., Kal Kallo .. .. .. | A, B, T | 1,872 |
| Colloran, J., Highway Poultry Farm, Five Ways | A, B, T | 2,086 |
| Cook and McKnight, Lyons-road, Croydon.. | A, [illegible] | 1,537 |
| Coulson, C. J., Burwood-road, East Burwood | A, B | 2,329 |
| Davey A. R., Sellars-street, Greensborough .. | A, B | 1,762 |
| Dislers, R., Bonnie View-road, Croydon .. | A, B | 857 |
| Dookie Agricultural College, Dookie .. | A, B | 3,468 |
| Eggleton, P. H., Bailey-road, Mount Evelyn | B, H, D | 685 |
| Ellis, E., 388 Dorset-road, Boronia .. | A, B, T | 671 |
| Feldtmann, R. W., "Rivershurst", Goorambat | A, B | 486 |
| Gilchrist, J., Frankston-road, Carrum Downs | A, B | 2,675 |
| Giovanetti, R., Epsom .. .. .. | A, B | 621 |
| Golden Poultry Farm P/L., 51 Playne-street, Frankston | T | 7,880 |
| Grenville, G. W., Springvale-road, Springvale | A, B, T | 4,812 |
| Hall, B., Pheasant Creek .. .. | A, B, T | 683 |
| Heape, H., Bulla-road, Tullamarine .. | A, B | 1,734 |
| Leach, R., Torquay-road, Grovedale .. | A, B | 1,393 |
| Longerenong Agricultural Colleg., Dooen .. | A, B | 845 |
| McCleary, K. L., Yelta-road, Merbein .. | A, B | 1,548 |
| McLaren, A. D., Ardmore Poultry Farm, Mooroopna | A, B | 780 |
| Manakker, H., Carlsbrook .. .. | A, B, T | 1,482 |
| Marsden, H., Inglewood-road, Raywood .. | A, B | 1,976 |
| Mickelburough, G. E., Kingston-road, Heatherton | A, B, T | 4,744 |
| Mickelburough, N., Old Dandenong-road, Heatherton | A, B | 3,536 |
| Mudford, C. G., Loughnan-road, Ringwood .. | T | 1,488 |
| Murphy, V. South Gippsland Highway, Cranbourne | A, B | 1,544 |
| Musgrove, J. M., 24 Yarra-road, Croydon .. | A, B, T | 5,877 |
| Neale, S., Edward-street, Lower Ferntree Gully | A, T | 1,262 |
| Nemet, P., Springvale-road, Springvale .. | A, B | 5,922 |
| Pederick, W. O., "Norman Lodge", Mt. Eliza | A, B | 4,373 |
| Pettigrove, T. H., Fulton-road, Blackburn South | A, B, T | 4,310 |
| Pettigrove, T. H., Brysons-road, Wonga Park | A, B | 3,927 |
| Reynolds, H. N., Potts-road, South Lyndhurst | A, B | 3,578 |
| Savage, V., Mrs., Rotherwood Poultry Farm, Stawell | B, C | 420 |
| Scales, J., Emu Creek .. .. .. | A | 2,080 |
| Schmidt, E. E., Box 646, Mildura .. | A, B, M | 2,371 |
| Shepherd, W. G., Murruduc-road, Drysdale | A, B | 2,460 |
| Skilbeck, E. W., Southern Cross via Koroit.. | A, [illegible] | 302 |
| Stephens, E., Reservoir-road, Bendigo .. | A, B | 2,924 |
| Stewart, H. D., Marshall-street, Maryborough | A, B | 3,117 |
| Taylor, H., 180 Surrey-road, Blackburn .. | A, B, T | 2,231 |
| Temple, E. and L., Morack-road, Vermont.. | T | 1,990 |
| Trewin, A. B., Box 62, Mooroopna .. | S | 186 |
| Tubb, F. and M., Hume Highway, Longwood | A, B | 844 |
| Turk, H. and B., Heatherton-road, Springvale | T | 1,579 |
| Tyack, A. G., Marungi .. .. .. | A, B, T | 1,534 |
| Watts, B., Bailey-road, Mt. Evelyn .. | D, M, S | 350 |
| Wright, A. Mrs., Wunghnu .. | A, B | 1,038 |

# FRUITGROWERS' FIELD DAY AT SCORESBY

*More than 250 fruitgrowers attended a field day in March at the Scoresby Horticultural Research Station. The field day was officially opened by the Minister of Agriculture, the Hon. G. L. Chandler, C.M.G., M.L.C.*

*Research officers described four different aspects of the Station's research work : Apple Pruning and Thinning Trials, Soil Management in Peaches, Control of Bitter Pit in Apples, and Maintenance of Quality of Apples and Pears during Storage.*

## Apple Pruning and Thinning Trials

Mr. G. Kuhlmann, Senior Field Officer, described pruning and thinning trials with different varieties of apples. The trees were planted in 1950. A series of apple seedling stocks was used and compared with Northern Spy stock. As it was expected that some of these trees on seedling stocks would be difficult to bring into bearing if pruned and trained in the normal way, half of the trees were trained under a lighter pruning system, called the Modified Central Leader system (MCL).

As expected, MCL trees produced blossom buds much earlier than normally pruned or Vase-shaped trees, but they were not allowed to bear fruit until the 1955–56 season. Since then the yields of MCL trees have increased rapidly and the differences in yield between the pruning methods were found to be far greater than the differences between rootstocks.

Then, in 1960, biennial bearing started to develop on Jonathan MCL trees and both Vase and MCL Stewarts and Delicious—but not on Granny Smith, which has continued to produce regular good crops so far.

Biennial bearing also developed on the Jonathan Vase trees, but two years later and less severely than on the MCL trees.

To overcome biennial bearing and also to improve size and colour (in Jonathan and Delicious) several thinning sprays were tried out this season. Because of the fact that a preliminary trial in 1961 with NAA (5 p.p.m.) was not very effective, five different treatments were tried out this year, and in some cases up to three sprays were used. There was a risk of overthinning, but this did not eventuate. The five different treatments used were as follows :

A. 2 sprays of "Sevin"*, 1st at petal fall, 2nd three weeks after petal fall.

B. 1 spray of "Sevin", 1 spray of NAA and "Tween 20"* at petal fall, 2nd spray of "Sevin" three weeks after petal fall.

C. 1 spray of "Sevin" at petal fall.

D. 1 spray of NAA+"Tween 20" at petal fall.

*Registered Trade Name.

Mr. G. Kuhlmann, Senior Field Officer, explaining pruning and thinning trials in the apple block at Scoresby.

Mr. H. Jager, Senior Field Officer, points to typical root development in the peach soil management trials.

E. 1 spray of "Sevin", 1 spray of NAA + "Tween 20" at petal fall.

Spray Concentrations: NAA 5 p.p.m., "Sevin" 0·1 per cent. =1 lb. per 100 gallons water.

At this stage only preliminary results can be given, based on estimated yields. Only the next year's harvest will show whether biennial bearing has been controlled or not. It seems that the best results were obtained by two sprays of "Sevin" either on their own, or in addition to NAA.

When comparing total yields of MCL and Vase trees for each year since bearing commenced in 1956, it is obvious that the total increase in production from the MCL trees compared with the Vase trees over the period of seven years is quite significant.

Approximate yields per acre in bushels:

Jonathan—520

Granny Smith—1,830

Stewart—1,400

Delicious—1,010

More experiments will be carried out to confirm the thinning effects and observe any tendency for a reduction in the extent of biennial bearing. The solution of this problem will bring us a good step forward towards higher production at lower production costs per case of fruit.

Granny Smith has not as yet shown any tendency to biennial bearing on the MCL system, and there is also reduced occurrence of bitter pit fruit from these trees. This would indicate that there is a case for trying out a lighter pruning system at least on a few trees of this variety.

## Soil Management Trials

Messrs. J. D. F. Black, Horticultural Research Officer and P. D. Mitchell, Experimental Officer, explained further developments in the Station's soil management trial in peaches. The exposed root system of a peach tree clearly showed that the roots expanded only about 6 inches vertically and that the root development was virtually stopped by between-row cultivation. The effective water-storing capacity of straw mulch was demonstrated. It was explained that peaches with permanent pasture definitely need additional nitrogen and additional watering. If there is difficulty in securing water through summer, early preparation helps to establish a good cover of grass and weeds. This cover will help to get rid of the excess water during winter.

## Calcium Spray Trials

Mr. P. Baxter, Horticultural Research Officer, reported on calcium trials, to reduce bitter pit in apples. He recommended 3 to 5 sprays of calcium nitrate, or calcium chloride. Calcium chloride may give rise to a marginal leaf scorch, but it is preferable on red coloured varieties as it does not delay maturity or reduce the red blush. Calcium nitrate is preferable on green varieties as it also acts as fertilizer and does not induce leaf burn. Soil applications of soluble calcium salts were not as effective as leaf sprays. *(Continued on page 271)*

# AUSTRALIAN SPARK ARRESTER TESTS

**TEST No. SPA—36†**

**(ORIGINAL TEST No. SPA—23, OCTOBER, 1939, RE-ISSUED MARCH, 1963)**

## CHAMBERLAIN COUNTRYMAN, CHAMPION, AND CANELANDER MODELS

**Tested for Chamberlain Industries Pty. Ltd., Welshpool, W.A.**

*Formal tests on spark arresters are conducted by The Tractor Testing Committee* at the Testing Station, Werribee, on behalf of those Companies concerned with tractors, engines or spark arresters, who wish to have these equipments tested. The arrester is tested on the engine for which it is especially designed, or if this is not convenient, it is tested on an engine having the characteristics and power for which the spark arrester is intended.*

### 1. Test Procedure

The method of test is based on a procedure standardised by the Society of Automotive Engineers (U.S.A.); this consists of feeding a weighed quantity of carbon particles of given size into the exhaust of the working engine, and then catching in a trap, and weighing, the particles that the arrester allows to pass through. Separate runs are conducted with particles of larger and smaller size; in some runs the engine is working at full load, in others at fast idle under no load.

According to the S.A.E. standard, no particles of the larger size should escape the arrester, and not more than 10 per cent. of the smaller size. At the same time the extra back pressure imposed on the exhaust system by the presence of the arrester should be no more than 10 inches in a water barometer.

### 2. Identification

*Name and Type*—Chamberlain.

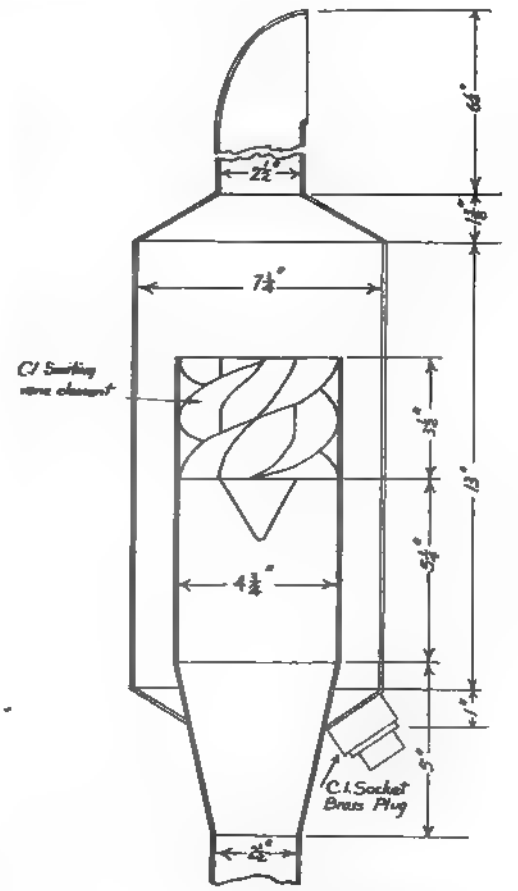
*Submitted by:* Chamberlain Industries Pty. Ltd., Welshpool, Western Australia.

*For Particular Engine:* Chamberlain Countryman, Champion, and Canelander Tractors.

### 3. Brief Specification of Arrester

*Operating Principle:* Centrifugal separator.

*Declared Maximum Horse Power:* Not stated.




Spark arrester for Chamberlain Countryman tractor.

*Dimensions:* Exhaust pipe, diameter 2¼ inches. Tail pipe, diameter 2½ inches, length 5 inches. Arrester, outside diameter 7½ inches, length 16 inches, weight 12 lb.

*Materials:* Body—16 g. Steel; Swirling vane element—Cast Iron.

*Mounting:* Vertical, ahead of operator, effluent to side.

*Details of Test Engine:* (*a*) Meadows Diesel in Chamberlain Countryman Tractor; 4 cyl.; 67 Horsepower max.; 330 cubic ins.; rated speed 1800 r.p.m.

(*b*) Perkins 4/270 Diesel as in Champion and Canelander Tractors. 4 cyl.; 55 h.p.; 270 cu. ins.; rated speed 2000 r.p.m.

## 4. Summary of Test Results

(*a*) *Effectiveness of Spark Arresting:*—

Particles injected at rate of 100 gms. in 15 mins.

| Particle Size. | Engine Load Condition. | Carbon Passing Arrester (Percentage). | | Remarks. |
|---|---|---|---|---|
| | | (*a*) | (*b*) | |
| Large .. | High .. | 0·1 | < 0·1 | Average of two tests |
| Large .. | Low .. | Nil. | Nil. | Two tests |
| Small .. | High .. | 0·2 | < 0·1 | Average of two tests |
| Small .. | Low .. | 0·1 | Nil. | Average of two tests |

(*b*) *Back Pressure:* At high load;

(*a*) 6½ inches water;

(*b*) 2·5–3·0 inches water.

## 5. Comments

(*a*) The arrester originally tested on the Countryman (Test No. SPA—23, October, 1959) was a prototype incorporating changes arrived at by an earlier series of trials. Chamberlain Industries adopted this as the stock model for the Countryman Tractor.

A sample of this arrester, as shown in the drawing on the previous page was re-tested in March, 1963, on the 4/270D engine as used in the Champion and Canelander Tractors. The one arrester will in future be used as standard equipment on all three tractors.

(*b*) *Life:* The arrester is of the type not able to be dismantled for inspecting and replacing the internal elements. According to the S.A.E. specification, therefore, its expected life should be equal to the life of the engine for which it is intended. The arrester seems likely to be able to meet this requirement.

(*c*) This report makes no promise about the likely performance of the arrester other than in the new condition in which it was supplied for test.

W. F. BAILLIE,
Testing Officer.

G. H. VASEY,
Officer in Charge
Tractor Testing.

University of Melbourne, March, 1963.

* The Australian Tractor Testing Committee is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: c/o Department of Primary Industry, 301 Flinders-lane, Melbourne.

† Last preceding issued report No. SPA-23.

# FRUITGROWERS' FIELD DAY AT SCORESBY—*(Continued from page 269)*

## Storage Problems

Dealing with storage problems of apples, Mr. I. D. Peggie, Horticultural Research Officer, pointed out that bruising is the biggest single complaint affecting the quality of apples. He emphasized that the part of the crop that is to be marketed by say, the end of July, should be picked at dessert quality. The remainder of the crop should be picked at an earlier stage of maturity to ensure longer storage life for later marketing.

Fruit should be sold before it is overstored —when even though it looks fair, it is tasteless and worthless. Most disorders during normal storage can be avoided now. Polythene lining of cases helps to reduce Jonathan spot and shrivelling. With pears most troubles are due to the storage of fruit which was immature or overmature at harvest.

We have no simple maturity test for pears as a guide to picking and therefore must be guided by calendar dates.

# NEMATODES AND PATHOGENIC FUNGI IN SOIL

## *Control by Physical and Chemical Methods*

J. W. Meagher, B.Agr.Sc., Senior Plant Pathologist, Biology Branch

***The following paper is one of four prepared by officers of the Plant Research Laboratory for the Plant Diseases Section of the Symposium "Recent Developments in the Control of Plant Pests, Diseases, and Weeds", held at the College of Horticulture, Burnley, in October. The Symposium was conducted by the Australian Institute of Agricultural Science. The opening address, by the Director of Agriculture, Mr. Frank M. Read, M.Agr.Sc., was published in the December, 1962, issue of this Journal.***

***The remaining three papers prepared for the Plant Diseases Section of the Symposium by Messrs. L. L. Stubbs, M.Agr.Sc., P. R. Smith, B.Agr.Sc., and P. T. Jenkins, B.Agr.Sc., will be published in subsequent issues of this Journal.***

The subject of this address covers a wide field as, other than the host plant itself, the soil is the ultimate repository and source of the organisms that cause disease in plants.

Problems of plant disease caused by these soil-borne organisms generally appear on soils which, under an intensive system of cultivation, have grown one crop continually or, too frequently, conditions which encourage the disease organisms and pests of that crop.

In controlling these diseases it is clear that certain management practices, particularly crop rotation, are of great importance. However, I do not now intend to discuss these methods of control. I shall, therefore, confine my talk to the control of nematodes and pathogenic fungi in the soil by the more direct physical and chemical control methods.

Unfortunately, these methods of control are expensive and can be applied only to high value crops. Therefore, the diseases that we aim to control by these methods are mainly those encountered in glasshouse and nursery practice and in high value field crops. The organisms causing these diseases include the "damping off" fungi such as species of *Pythium*, *Phytopthora*, and *Rhizoctonia*, wilt diseases caused by species of *Fusarium*, *Verticillium*, and *Sclerotinia* and various genera of parasitic nematodes.

### Control by Heat

Control of soil-borne pathogens by heat has been an accepted commercial control method for over half a century and is commonly used in nursery practice.

When we speak of soil sterilization by "heat" we generally mean "steam". It is true that a dry source of heat may be used for treating soil (e.g. metal heated by a flame or by electricity). However, by comparison with steam, this method, of sterilizing soil is generally unsatisfactory because it is necessary to apply an intense heat (i.e., a very high temperature) to a limited area and the distribution of heat through the soil is poor. On the other hand, steam imparts a large quantity of heat at comparatively low intensity (i.e., 212° F.) and can be evenly distributed. Hot water has also been used but the disposal of the excess water is a disadvantage in this method.

### Limitations of Steam

Until quite recently it has usually been considered that because of practical difficulties and expense the sterilization of large areas of soil by heat was not possible. Recent developments in this field, which we will discuss later, now make this a distinct possibility. For the present, however, the use of steam is confined to small areas of land such as used by the nurseryman in

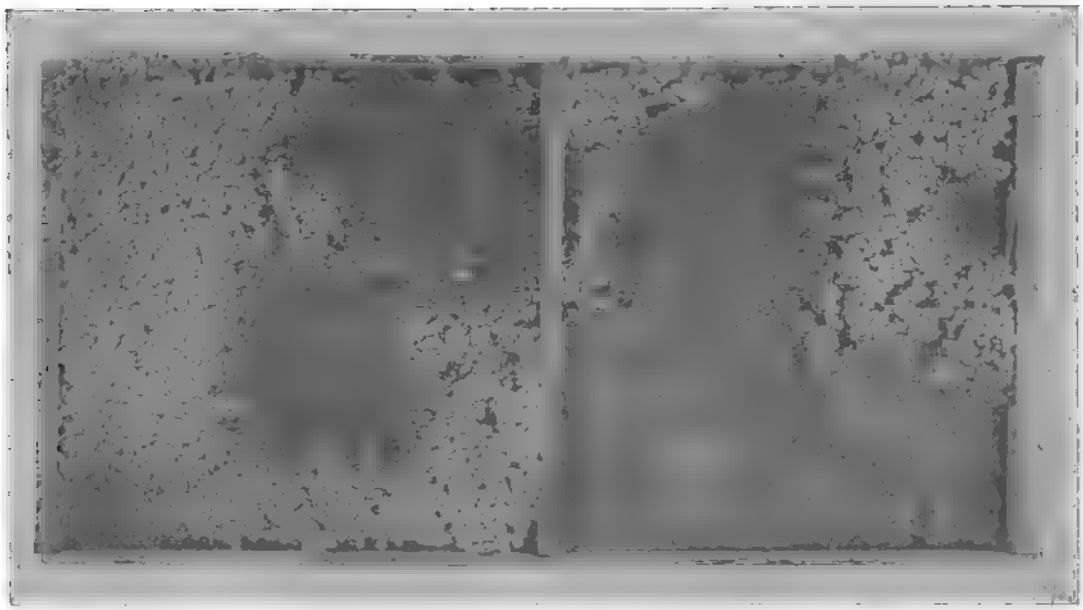


Fig. 1.—Damping-off of seedlings following the recontamination of sterilized soil by a pathogenic fungus.

glasshouses and seedbeds. Fortunately, it is often just these situations where the soils show the greatest need for sterilization, as the conditions are so favourable for the rapid multiplication of soil-borne pathogens.

The nurseryman cannot solve his disease problems by the continual importation of virgin soil. In any case, apart from the difficulty of obtaining such soil, it may also contain fungal parasites which cause "damping off" diseases of seedlings.

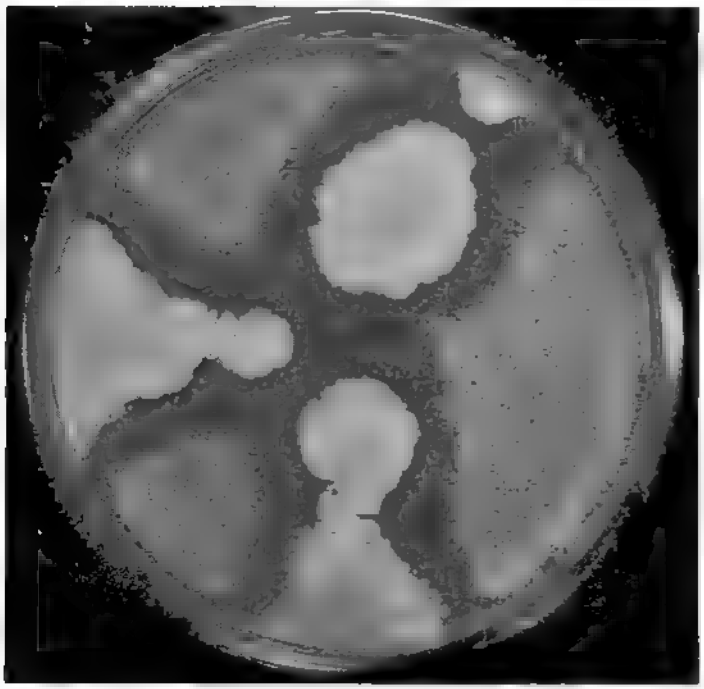


Fig. 2.—Microbiological antagonism in culture. Streptomyces inhibits the growth of the brown rot fungus *Sclerotinia fructicola*.

Thus, steaming the soil is a method of soil sterilization practised by the commercial nurseryman who grows large numbers of seedlings and where some method of soil sterilization is essential if disease problems in the seedbed are to be avoided.

The methods used in applying the steam to the soil are too numerous to discuss here in detail but, basically, steam sterilization is effected by continually passing large quantities of steam under pressure (about 60 lb per square inch) into the soil until the temperature reaches 200–212° F. The treatment is then continued for 30 minutes or more which is sufficient to kill all fungal, bacterial, and nematode pathogens plus soil insects and weed seeds. There is a major hazard in the handling of soil that has been sterilized in this way and this is the danger of recontamination by fungal pathogens. (Baker, 1957).

## Microbiological Antagonism

It is now well recognized that antagonisms exist between the various micro-organisms present in the soil. These organisms maintain stability in the soil and prevent the widespread multiplication of a single organism. Such antagonism can be readily demonstrated *in vitro* where several organisms are grown together in culture. Antibiosis may play an important part in the microbiological antagonisms in soil although this is not yet fully understood. Nevertheless, it is well recognized that the greater the numbers and varieties of the microflora in the soil the greater the " microbiological stability ".

When soil is sterilized by steam at 212° F. for 30 min. the ecological balance of the soil is upset resulting in what has been called " a biological vacuum ". If a pathogenic fungus is introduced while the soil is in this unstable state, it will spread rapidly being unhindered by any microbiological antagonisms. Thus, great care must be taken to prevent recontamination.

What I have discussed so far is not new but has been necessary to provide a background for what we can consider to be recent developments in the field of sterilization of soil by steam.

## Recent Developments

There are two ways of overcoming this problem of recontamination. The first is to re-inoculate the sterilized soil with one or more selected known antagonists of the pathogens which may be encountered. However, although the effectiveness of this method has been demonstrated it does not appeal as being a very practical one and in addition this " controlled colonization " is relatively unstable owing to the small number of micro-organisms involved. Because of this there is the possibility of one of the retardant micro-organisms gaining

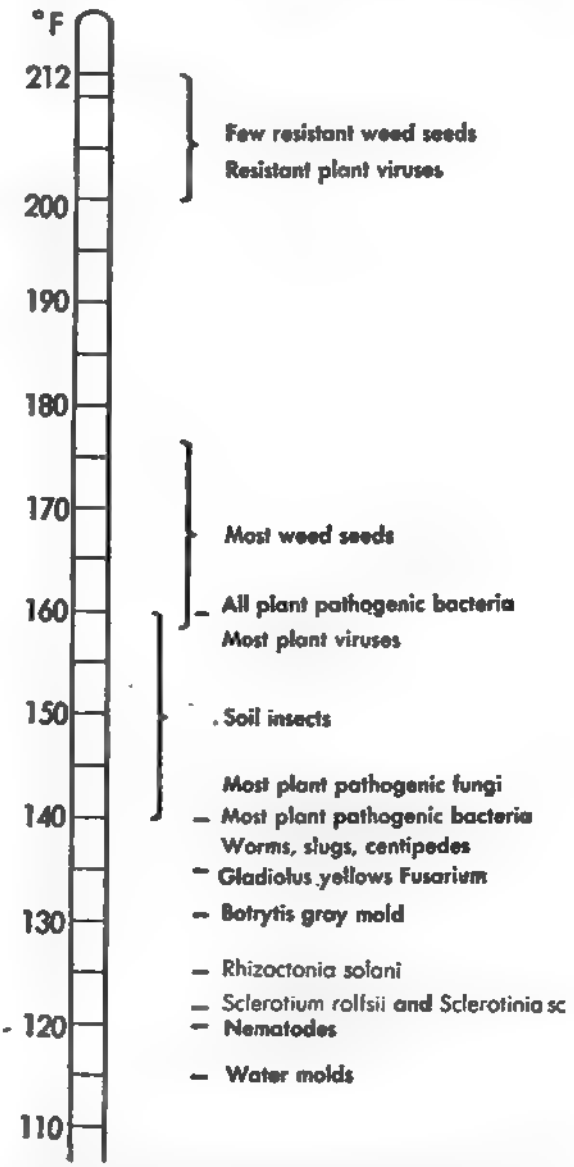



Fig. 3.—Temperatures necessary to kill pathogens and other organisms harmful to plants when exposed for 30 mins. under moist conditions. [After Baker 1957.

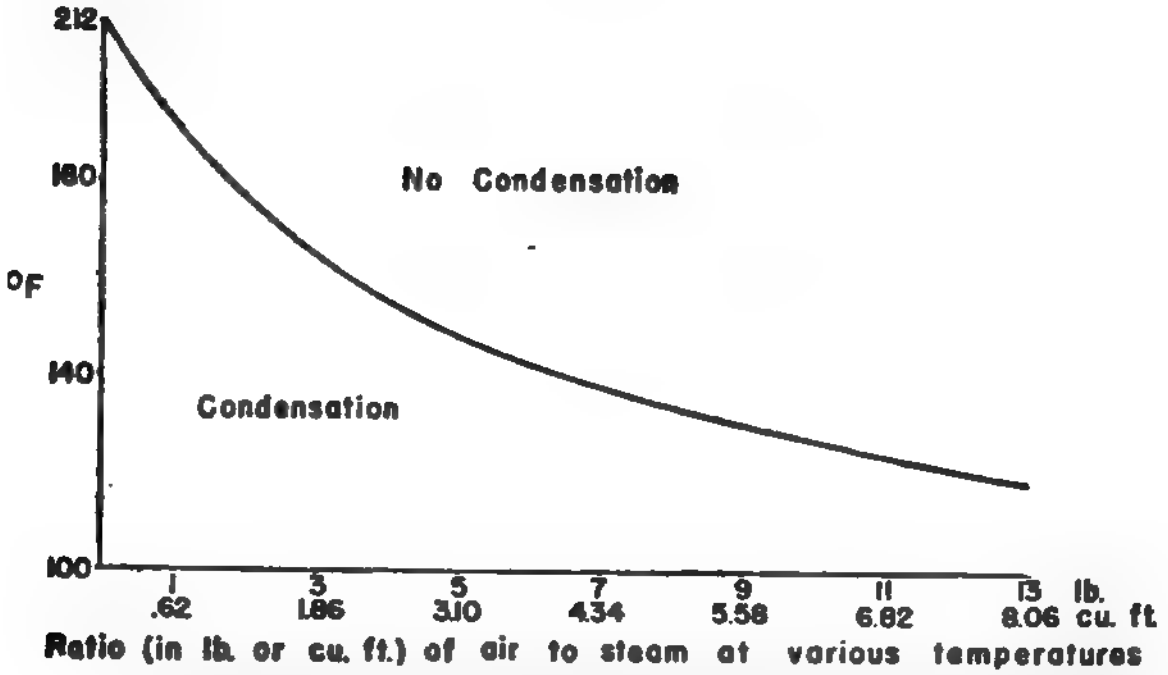



Fig. 4.—The ratio, by volume and weight, of steam and air required to heat soil or plant material to indicated temperatures, i.e. the condensation temperatures of aerated steam mixtures. [After Baker 1957.

ascendancy and producing such a toxic effect that the crop may be stunted or killed.

The alternative method of providing micro-biological antagonisms to fungal pathogens appears to be much more satisfactory and, thanks to the work of Baker (1962) appears to be a completely practical one.

If we examine the temperature-time chart showing the thermal death points of organisms in the soil (Fig. 3) we see that a temperature-time combination of 140° F. for 30 min. is sufficient to control most of the pathogenic organisms. It is true that one or two plant pathogenic bacteria or soil-borne viruses may escape this treatment, but they will be present only in exceptional circumstances. But as there are many saprophytic organisms able to tolerate this treatment we are left with a complex residual microflora which will maintain sufficient biological antagonism to overcome the problem of recontamination.

### The Use of Aerated Steam

Baker has developed a method whereby it is possible to treat soil at a temperature lower than the 212° F. necessary in the steam sterilization techniques previously employed.

Although it is possible to treat a *moving* soil mass with either steam or dry heat to temperatures lower than 212° F., when a *stationary* soil mass is uniformly steamed, it is inevitable that a temperature of 212° F. is reached.

Baker has overcome this problem by the use of a steam-air mixture or "aerated steam". By diluting the steam with an appropriate quantity of air it is possible to heat the soil to any desired temperature without fear of this temperature being exceeded, e.g., a temperature of 140° F. is obtained by mixing 1 volume of steam with a little over 4 volumes of air (actually 4·34).

Because steam moves through soil as an advancing front, temperature rise at a given point is usually quite sudden. Steam condenses on the nearest cold soil particles and does not penetrate farther until it has heated them to 212° F.

By diluting the steam with air the temperature of water vapor is lowered below 212° F. This results from increasing the space between molecules of water vapour rather than from condensation of steam.

This aerated steam has a fixed temperature and moves through the soil in the same manner and at the same velocity as ordinary steam. The thermal efficiency is at least as good as with undiluted steam and by varying the ratio of air to steam precise temperature control is easily obtained (Baker and Olsen 1960).

### Practical Applications

In practice there is more than one way in which the air may be mixed with the steam. The original method used was simply to link an air compressor to the steam pipe. By manipulating valves, the desired steam–air ratios were obtained. A simple and successful modification has been to use the pressure of the steam itself to suck in air on the Venturi principle. This aerated steam need not be injected into the soil itself, but can be used to control the temperature of a steam vault in which boxes or flats containing soil are stacked.

### Other Uses for Aerated Steam

The development of this aerated steam method has provided a practical realization of "partial sterilization" which has long been recognized as being desirable but difficult or impossible to obtain when steam only was used as the source of heat. In addition—and economically this is most important—there is a considerable saving in the cost of treatment because, at the lower temperature used, much less steam need be generated.

Aerated steam is also being developed in other ways. For example, it provides a constant temperature for the treatment of seeds about which more will be told later. In the treatment of soil, however, it could provide the means whereby steam treatment of field soils may become an economic possibility. As stated previously, with the lower temperatures a much lower quantity of heat per unit volume of soil is needed and a much larger volume of aerated steam is available than if steam alone were used.

The mechanical means for commercially treating fields with aerated steam are rapidly being perfected in California by Baker (1962). One machine employs a 12 ft. wide steam blade pulled by a caterpillar tractor. This is able to heat soil to a depth of 18 inches and move forward at the speed of a few feet per minute.

It is not yet known whether this method will provide any serious competition to the alternative methods to steam sterilization, namely, sterilization of soil by chemicals.

### Chemical Sterilization

As explained earlier, sterilization by steam is very expensive and is still confined to nursery practice. Where sterilization of field soils is required or where steam is not available in the nursery, certain chemicals have been found to provide a satisfactory alternative, although they may not always be completely effective in eradicating all pathogens. Great progress has been made in this field in recent years, and we are now presented with a choice of materials which we may choose according to our needs.

Some of these are known as "broad spectrum" chemicals, i.e., they kill a wide range of fungi, nematodes, soil insects and weed seeds and, where problems of this nature are present in the field, they may be considered a satisfactory alternative to steam. Others are more selective being mainly effective against either nematodes or fungi, and are used according to the disease problem anticipated.

Unfortunately, all of these materials, particularly the "broad spectrum" chemicals, are still expensive and their use is confined to crops providing a high return for each acre treated.

We will not be able to discuss here the various techniques employed and soil conditions required to obtain effective control with these chemicals, but it is necessary

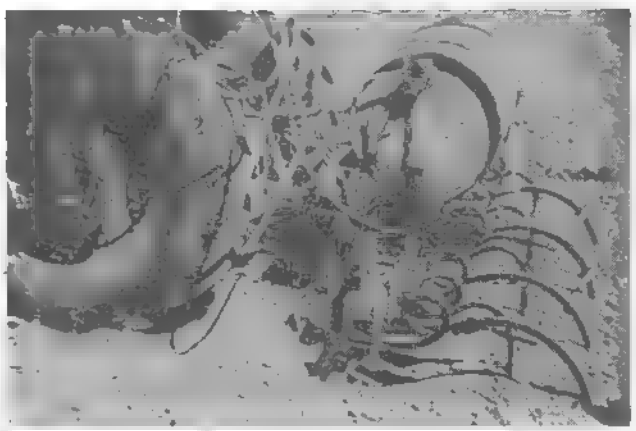


Fig. 5.—One of the many types of tractor-drawn soil injectors used in the application of soil fumigants.

to have the soil in the right condition for treatment particularly in regard to moisture content and tilth and often to provide a suitable surface seal. We might consider, however, the various chemicals sometimes used in the treatment of soil for disease control.

## Chemicals Used

*Carbon disulphide* was one of the first chemicals to be used and was originally employed against phylloxera of the vine in 1872. However, it has low potency as a fungicide and it is now rarely used except in the control of the root fungus *Armillaria mellea*.

*Formaldehyde* was also one of the earlier chemicals used in the treatment of soil. Although it is still used to a certain extent for this purpose, it is more generally used in hygienic practices such as the disinfecting of containers, greenhouse benches, shelves, &c.

Its use in the treatment of soil has largely been superseded by methyl bromide or chloropicrin, or a mixture of these two chemicals.

*Chloropicrin* was developed as a tear gas in the first world war and shortly after was found to be a highly efficient soil fumigant. However, there are serious disadvantages in its use. Apart from its expense it produces a gas which is an extreme irritant of the eyes and mucous membranes and the use of a gas mask by operators is essential.

*Methyl Bromide* also produces a poisonous gas when injected into the soil and its effect is more insidious than chloropicrin because it may not readily be detected. For this reason a small quantity of chloropicrin is often included to provide a warning of the proximity of dangerous fumes.

Recently, however, mixtures of chloropicrin and methyl bromide have been used together for other reasons. Johnson *et al* (1962) have reported that a mixture of these materials, applied together, are often much more effective than when either is applied alone. This may enable a lowering in the recommended dosage rates which, in turn, may make the cost of treatment a little more reasonable. At present, in Victoria, it costs about £150 to £200 to treat one acre of soil with a chloropicrin-methyl bromide mixture.

## Applications of Chemicals

Because of the difficulty of handling these materials and the limitation of their use to high value crops, little use has been made of them in treating field soils in Australia. However, in the last year or two, suitable equipment for their application has become available here and, if they wish, growers may have their soil fumigated under contract. With the further development of the techniques of application (e.g., the use of thin plastic sheeting laid down continuously from rollers carried behind the tractor) we might expect a further reduction in the cost of treatment.

Chloropicrin and methyl bromide are called soil fumigants because they are volatile liquids which evaporate when injected into the soil and move through the soil as a gas. In recent years a different type of "broad spectrum" chemical has been produced. *Vapam** (Sodium N-methyl dithiocarbamate) and **Mylone* (Dimethyltetrahydrothiadiazine-thione) are examples.

These are white crystalline solids readily soluble in water and are usually applied in water as a soil drench. These compounds are unstable in moist soil and the products of their decomposition are effective against a wide range of pathogenic fungi, nematodes and weed seeds. They may have some advantages over chloropicrin and methyl bromide in that they do not require special equipment in their application but are still rather unpleasant materials to handle. In addition, their use in the field is limited because of the large quantities of water (at least 1 gallon of water per square yard) required to spread the material through the soil. Their use, therefore, is not practical in the absence of irrigation. However, they do have considerable value in the nursery in the treatment of seedbeds, also in the establishment of turf and for the pre-treatment of planting sites in replanting perennials such as fruit trees and ornamentals.

## Selective Chemicals

Complete or nearly complete soil sterilization of the soil is not always required and control methods may be directed at either pathogenic fungi or plant parasitic nematodes. In these cases it is possible to use a material that is more selective in its action (i.e., either fungicidal or nematicidal) and this is available at lower cost.

* Registered Trade Names.

Fig. 6.—Control of root-knot nematodes on tobacco by soil fumigation with E.D.B. Plants grown in fumigated soil surround an untreated plot.

Fungicides when applied to soil tend to be selective and, other than the broad spectrum chemicals, there are no fungicides which, when applied to soil, will control all fungal pathogens. Their effect might often be considered to be fungistatic rather than fungicidal (i.e., their effect is one of suppression rather than eradication).

The fungicides used in this way include captan, ferbam, thiram, nabam, semesan, and P.C.N.B. (*pentachlornitro-benzine*). Their use is confined to spot treatments in soil to prevent the spread of a disease such as damping-off in the glasshouse or to protect the developing roots such as in the control of club-root of crucifers. In this regard we must not forget the long established use of mercuric compounds, particularly mercuric chloride, which has been very useful against some fungal pathogens in the soil and also is toxic to nematodes. The disadvantage of mercuric chloride, and indeed of several fungicides used in the soil, is their tendency to produce toxic effects in some plants. Of course, mercuric chloride also has a high mammalian toxicity.

## Nematicides

The control of plant parasitic nematodes by the use of nematicides applied to the soil has made tremendous strides in the past twenty years (Taylor 1960). This is partly because of the increased recognition of the effect that certain nematodes may have on plant growth, but it is probably as a result of the development of effective nematicides that nematodes have gained this increased importance as a cause of plant disease.

Prior to 1943 both chloropicrin and methyl bromide had been used to control nematodes in soil but it was in 1943, when Carter, working in Hawaii, showed that D–D mixture was an efficient nematicide, that the widespread use of chemicals in nematode control really began.

D–D (a mixture of dichloropropene and dichloropropane) is a by-product of petroleum refining and was found to be an excellent nematicide when injected into the soil at 12-inch intervals at the rate of about 20 gallons per acre. Later, in 1946, E.D.B. (ethylene dibromide) was also found to be effective. By comparison with chloropicrin and methyl bromide their relatively low cost and ease of handling made their use feasible on soil used for field crops of moderate value. Even so, their cost (approx. £20 per acre) is still sufficient to exclude their use on low value crops such as cereals, pastures, and even potatoes.

Today, nematicides are well established in agriculture and in the chemical industry. Where applicable, they will control nematode infestations quickly and effectively though usually for a limited period. Large quantities are used in the United States and their use is increasing in Australia. At present the largest use of nematicides is for the control of nematodes in soils used for annual crop plants, their application being made 2 to 3 weeks prior to planting. This is because all the materials that we have discussed so far including the "broad spectrum" materials are toxic to plants and a waiting period is necessary to allow all toxic fumes to leave the soil.

In recent years several nematicides have been produced which can be applied around the roots of many living plants without resulting in phytotoxicity. These include *"VC–13" (0–2, 4—dichloropenyl 0, 0 diethyl phosphorothioate), *"EN 18133" (0, 0 diethyl 0, 2 pyrazinyl phosphorothioate) and D.B.C.P., (dibromo-chloropropane). Materials such as these have raised the interesting possibility of controlling nematodes in and around the roots of perennials such as orchard trees, vines, and ornamentals. Already some progress has been made in this direction. The development of a systemic nematicide without toxic effects to the plant which might be expected to appear in the future would be a major advance in this field.

## Side Effects of Sterilization

A discussion on the sterilization and partial sterilization of soils would not be complete without mention of some side-effects of soil treatments.

Firstly, it has been shown that treatment of soils by steam or chemicals may sometimes produce a "soil amendment" effect which is usually interpreted as an inhibition of the nitrifying and stimulation of the ammonifying microflora, but it also makes other plant nutrients more readily available. (Tam, 1945; Spencer and Jack, 1950). Thus a growth response may occur even in the absence of pathogenic fungi or nematodes. However, under certain conditions this same inhibition of the nitrifying microflora may result in ammonium toxicity.

In the soil, organic nitrogen must first be converted to ammonium or nitrate nitrogen before the plant can utilize it. Some organisms first carry the reactions from ammonium to nitrite and then others convert from nitrite to nitrate nitrogen. The nitrifying bacteria are very specialised in their function and are also very sensitive to treatment by steam or chemicals. A much wider range of organisms are capable of carrying out the conversion of organic nitrogen to ammonium compounds; they are not so sensitive to heat and, in addition, they include many common air-borne fungi and actinomycetes. Therefore, the soil is recolonized by these organisms much more rapidly than by the nitrifiers.

Where an excess of easily decomposed organic matter is available this may lead to the accumulation of a toxic concentration of ammonium ions. The effect of this accumulation may be variable because some plant species are more sensitive to ammonium than others. In addition, symptoms of ammonium toxicity may be intensified by a low level of nitrate in the soil or where wet, cold soil prevents the nitrifiers building up nitrate at a rapid enough rate. Also under acid conditions plants are less capable of metabolising the ammonium ions they absorb. Briefly, therefore, ammonium toxicity is more likely to occur following soil sterilization where there is a lot of decomposable organic matter present or where the soil is very wet, cold or acid.

## Prevention of Ammonium Toxicity

Apart from avoiding these conditions whenever possible, the best way of overcoming ammonium toxicity when it is likely to occur is to apply nitrate fertilizers as a top dressing and avoid the use of ammonium fertilizers which only intensify the symptoms.

The dangers of ammonium toxicity in sterilized soil may provide the aerated steam method with an added advantage as, at the lower treatment temperatures, there is less likelihood of eliminating the nitrifying organisms.

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* Registered Trade Names.

# Registration of Stallions

## *43rd Annual Report*

A. R. Grayson, B.V.Sc., Chief Veterinary Inspector

The number of stallions registered under the Horse Breeding Acts for the year 1962–63 was 58 draught, 121 light, and 327 pony stallions. This was a decrease of 11 on the number registered for 1961–62.

Since 1939, in which year more than 1,000 draught stallions were registered, the draught horse industry has rapidly declined, and the number registered (at present 58) indicates the declining economic importance of this industry.

During the year under review, the number of stallions examined by the veterinary staff was 158, of which 18 were draught, 50 light, and 90 pony stallions. Of these, two were refused registration because of unsoundness, and one because it was considered below a reasonable standard in respect of type and conformation. One hundred and fifty-five stallions were passed for registration, an increase of five on the previous year.

### Two-year-old Colts

The amended Horse Breeding Act now provides for the registration of two-year-old colts, the owners of which desire to use them for service. Owners must make application for registration on the prescribed form, and each application must be accompanied by a fee of £1. The colts must be submitted for examination by a veterinary officer, and if passed, will be registered as colts for one year.

During the year under review, 7 colts, comprising 1 draught, 2 light, and 4 pony were examined, and one was refused registration as it was considered to be below a reasonable standard in respect of type and conformation.

### Examination of Mares.

Breeders are reminded that, under a voluntary scheme, stud book draught mares may be submitted for examination for soundness. A fee of £1 is charged for the examination, and certificates for soundness are issued for three-year-olds and four-year-olds, and life certificates for mares five years of age and over. This year 13 mares were submitted for examination, and all were passed for certification.

In the past, many owners have availed themselves of the opportunity of having their mares examined, and it is hoped that during the coming season stud breeders will present at least some of their mares for examination.

### Appeals

During the year no appeals against the decisions of examining officers were lodged.

### Parades for the Coming Season

Where possible, arrangements will be made to examine stallions at centres most convenient to those owners from whom applications have been received. Applicants should state which main town would be suitable for them to present their stallions for examination, and they will, in due course, be notified of the date, time, and place arranged for the examination.

Provided owners forward their applications by July 1, as required, it is felt that, by such an arrangement, every stallion will be examined before the commencement of the breeding season.

Applications for registration must be made on the prescribed forms before July 1, and must be accompanied by a fee of £1 10s. (£1 for registration, and 10s. for compensation fee) in respect of stallions 15 years of age and under, and a fee of £1 1s. in respect of stallions 16 years of age or over 16 years. The necessary forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Changes of ownership must be notified without delay, in order that certificates of registration may be endorsed accordingly. Registration expires within 30 days of change of ownership unless the required notice is given.

## Summary of Stallion Examinations 1961–62.

| —— | Draughts. | | Lights. | | Ponies. | | Totals. | |
|---|---|---|---|---|---|---|---|---|
| | Examined 21 | Certified 21 | Examined 38 | Certified 38 | Examined 97 | Certified 94 | Examined 156 | Certified 153 |
| | Rejected | % Rejected | Rejected | % Rejected | Rejected | % Rejected | Rejected | % Rejected |
| Bone Spavin .. .. | .. | .. | .. | .. | 3 | 3·09 | 3 | 1·92 |
| Total .. .. | .. | .. | .. | .. | 3 | 3·09 | 3 | 1·92 |

## Summary of Stallion Examinations 1962–63.

| —— | Draughts | | Lights | | Ponies. | | Totals. | |
|---|---|---|---|---|---|---|---|---|
| | Examined 18 | Certified 18 | Examined 50 | Certified 48 | Examined 90 | Certified 89 | Examined 158 | Certified 155 |
| | Rejected | % Rejected | Rejected | % Rejected | Rejected | % Rejected | Rejected | % Rejected |
| Ringbone .. .. | .. | .. | 1 | 2·0 | .. | .. | 1 | 0·66 |
| Bone Spavin .. .. | .. | .. | .. | .. | 1 | 1·1 | 1 | 0·66 |
| Disapproval .. .. | .. | .. | 1 | 2·0 | .. | .. | 1 | 0·66 |

## Unregistered Stallions Retained by Owners for Use with Their Own Mares.

Under the provisions of the Horse Breeding Acts, the owner of any stallion, the registration of which has been refused, may, on payment of a fee of £1 per annum, and notification to the Chief Veterinary Inspector, retain such stallion for use with his own mares only.

| Name. | Age and Class. | Owner and Address. |
|---|---|---|
| Alcoran .. .. .. .. .. | A.L. .. | C. H. Gibbs, P. B. Rochester |
| Apepa .. .. .. .. .. | A.L. .. | S. S. Moulton, "Parkly", Newry |
| Donkey Dave .. .. .. .. .. | A.L. .. | C. J. Denny, Twin Creeks, Jancourt, East Roadside |
| Flash .. .. .. .. .. | A.P. .. | N. F. Sanders, 18 Rose-street, Sale |
| Forest Dale Cavalier .. .. .. .. | A.D. .. | E. F. Arthur, Wall |
| Golden Sandy .. .. .. .. .. | A.P. .. | M. L. Goodall, 115 Hurd-street, Portland |
| Goldies Pride .. .. .. .. .. | A.P. .. | T. G. Phelan, "Sunnydale", Boorolite, via Mansfield |
| Helpringham Pathfinder 2nd .. .. .. | A.D. .. | C. S. L., 45 Poplar-street, Parkville |
| La-De-Da .. .. .. .. .. | A.P. .. | Miss B. Trewen, "Orana", Sims-road, Briar Hill |
| Limerick Spring .. .. .. .. .. | A.L. .. | R. J. Dick, Box 62, Irymple |
| Little Sport .. .. .. .. .. | A.P. .. | G. Croxford, Goomalibee-road, Benalla |
| Paint .. .. .. .. .. | A.P. .. | H. G. Raymond, St. Albans, Geelong |
| Silver Lining .. .. .. .. .. | A.P. .. | W. L. Curtis, Oxley P.O. |
| Smart Lad .. .. .. .. .. | A.L. .. | H. Dunbar, Box 58, Traralgon |
| Snow Drift .. .. .. .. .. | A.L. .. | D. Farquhar, Calder Highway, Diggers Rest |
| Solo .. .. .. .. .. | A.P. .. | L. Weatherby, Streatham |
| Star Actor .. .. .. .. .. | A.L. .. | G. Lindsay, Jun., Mansfield |
| View Banks Salute .. .. .. .. | 7 Y.O.P. .. | M. Hedwards, Patchewollock |
| Welkin Sun .. .. .. .. .. | A.L. .. | M. R. Macrae, 31 Kambrook-road, Caulfield |

A.—Aged. D.—Draught. L.—Light. P.—Pony.

*The Flower Garden*

# PLANTING DECIDUOUS SHRUBS AND TREES

A. J. Plumridge, Assistant Horticultural Instructor, College of Horticulture, Burnley

Floribunda roses are free-flowering and make excellent hedges. [After R. H. S. Journal.

June and July, when deciduous trees and shrubs are most dormant, are the best months for planting.

They can of course, be planted at other times, but there are disadvantages in this. They will have to be planted from tins or pots and in nearly all cases they will be to a certain extent, rootbound. Root disturbance at other than the dormant period may cause setback. If planted at other times care must be taken to disturb the roots as little as possible which means that in many cases they are planted with their roots bound and often fail to grow well later.

Deciduous trees and shrubs should be planted in their permanent positions without delay as root activity commences well before the bursting of the buds.

## Rootbound Plants

If the plants are purchased in tins or pots and are at all rootbound, (trees become rootbound very quickly in containers) then the roots should be loosened and spread out so that they can expand and grow freely again.

## Bare Rooted Plants

With trees and shrubs which are lifted out of the ground, there is not this danger. When handling them, even during winter when they are completely dormant, the roots should not be exposed to the air longer than is necessary, however cold or wet the weather might be.

## Roses

One of the most important shrubs for planting during winter are the roses, bush and standard, floribundas and climbers. Roses and other shrubs which possess a large number of varieties should be ordered early as the popular varieties are sold quickly. Roses should be obtained without delay. If permanent positions are not ready for them when they arrive the plants should be placed in the soil for the time being and set out later.

The following trees and shrubs should be obtained and planted during the next couple of months.

## TREES FOR COOL DISTRICTS

### Aesculus (The Horse Chestnuts)

These are handsome trees with spreading branches and ornamental foliage and flowers. The two commonest species are *A. carnea*, the Red Horse Chestnut, with pink flowers and *A. Hippocastanum*, the common Horse Chestnut, with white flowers. Their fruits are not edible.

### Betula (The Birches)

These comprise one of the loveliest groups of all trees and will grow over most of the State (except the very hot parts) if the conditions are good.

*B. Alba Urticifolia* (The Cut Leaf Birch) is a very beautiful tree. There are also purple and weeping forms. Birches are often spoilt by having the centres cut out. The main stem should be allowed to grow straight and untouched.

### Cercis Silaquastrum (The Judas Tree)

This is a beautiful small flowering tree which will grow well in most of the southern districts if the conditions are good. It is leguminous and the masses of small light purple flowers come before the leaves in early spring.

### Acer (The Maples)

The Maples are grown for their autumn coloured leaves which are very attractive. There are several species of Acer, some of the best colouring ones being *A. Palmatum* (Japanese Maple) and the numerous varieties belonging to it. *A. Saccharum* (Sugar Maple).

*A. Negundo Argentea Variegatum* (Ghost Maple) and *A. Negundo Aureo Variegatum* are two small quick growing ornamental trees which are hardy and suitable for small gardens.

### Liriodendron Tulipifera (The Tulip Tree)

The Tulip Tree is a large deciduous tree with handsome leaves which turn clear yellow in autumn. It also bears attractive flowers in early summer, greenish yellow in colour with orange markings. It grows into a handsome pyramidal tree.

### Liquidambar Styraciflua (The Sweet Gum)

The Liquidambar is one of the best autumn colouring trees available. As with the birch the main stem should not be cut. While the tree is young it grows pyramidal in form, but as it ages tends to grow wider at the top.

### Fraxinus (The Ashes)

There are several species of Ash, some of which will thrive in most districts of the State, even the hottest parts. Three of the most suitable to grow in cool districts are *F. Excelsior Aurea* (The Golden English Ash) the bark of which is a bright golden colour. This makes the tree attractive even when denuded of foliage. There is a weeping variety of Golden Ash which is an attractive tree.

*F. Raywoodii* (The Claret Ash) is a tree of great beauty which will also thrive in hot districts.

*F. Ornus* (The Flowering Ash) bears whitish flowers on the tips of the branches.

Oaks are among the most beautiful of deciduous trees, and look their best in a large garden.
[After "Melbourne's Garden".

### Tilia (The Linden Tree)

*Tilia Europaea* is a beautiful tree which requires a deep moist soil. It thrives in hill country.

### Quercus (The Oaks)

Oaks are among the finest of the deciduous trees. There are a many species of Quercus. Several of the most popular are *Q. Coccinea ; Q. Palustris ; Q. Rubra,* which are grown for their autumn colouring leaves and *Q. Pedunculata* (*Q. Robur*), The English Oak which grows into a noble tree. The foliage is sometimes spoilt in late summer by attacks of red spider.

One other oak worthy of mention is the Chestnut Oak.

Some oaks are not always easy to transplant as most of them are propagated from seed. They are most easily transplanted if they are raised in large tubes.

### Small Trees and Shrubs for Cool Districts

The following are some small trees and shrubs of special merit suitable for planting in cool districts : CERCIDIPHYLLUM JAPONICUM ; ENKIANTHUS CAMPANULATUS ; MAGNOLIAS ; PARROTIA PERSICA ; PYRUS SORBUS ; CORNUS ; CRATAEGUS ; RHUS ; VIBURNUMS ; ARONIA.

## SHRUBS AND TREES FOR HOT DISTRICTS

Although most deciduous shrubs and trees favour cool hill country (most of them come from the cool parts of the northern hemisphere). Some will thrive in the hotter districts. Several of the most useful are :

*Fraxinus Raywoodii* (The Claret Ash) has already been mentioned and is one of the loveliest autumn colouring trees available. *F. Oxycarpus* (The Desert Ash) is a very good shade tree. These two ashes are to be seen thriving in the Wimmera and other hot districts. They will grow well over a wide range of climate.

*Lagerstroemia* (The Crape Myrtle) Although native to the hot parts of Asia the Lagerstroemias are deciduous.

There are several varieties and colours. *L. Indica Rosea* is a particularly fine large shrub or small tree which produces large trusses of crepe like flowers in late summer. It makes quite a useful shade tree if trained rightly to grow on a small lawn. *L. Eavesii* is a small growing variety with pale mauve flowers.

The Lagerstroemias have a wide climatic range and will grow well in districts such as Melbourne.

*Diospyros Kaki* (Japanese Persimmon) A small growing tree which produces large luscious and colourful fruit in late autumn.

There are several varieties of Diospyros ; some produce large seeds from which young ones can be raised, but they are worthless as fruiting trees or for stocks.

The named fruiting varieties of Diospyros have to be worked either by budding or grafting and the only two species used as stock are *D. Virginiana* and *D. Lotus*, the the first mentioned is probably the better stock.

The Persimmon is an attractive ornamental tree. Apart from its fruits the leaves turn lovely colours in autumn. It will grow in a large range of climates and does well in the southern districts.

*Poinciana Gilliesii* (The Bird of Paradise) A fairly large shrub which is grown mainly for its attractive red and yellow flowers in late summer and early autumn.

*Prunus* (Flowering Plums) The early flowering plums are among the best of the blossoming trees. Some like *P. Pissardii Nigra,* as well as their lovely blossom, have richly coloured foliage. They will also grow well over most of the State.

Other small growing deciduous trees which thrive in the northern districts are :

The Pomegranate, (*Punica*), *Tamarix Pentandra* (*Aestivalis*) (The Flowering Cypress) and *Melia Azedarach* (The White Cedar) an exceedingly valuable tree for shade.

Efforts should be made in all districts to plant trees. The main value of deciduous trees is that they give shade and shelter during summer and let in the light during winter.

# THE VEGETABLE PATCH

R. O. KEFFORD, B.Agr.Sc., Agronomist (Vegs.)

Growth of vegetables is restricted by low temperatures in July, but can be stimulated by nitrogen side-dressings. If crops are unhealthy check the drainage of the beds as water-logging will restrict root growth. Lime, at 4 to 8 oz. per square yard, is best applied during the winter months to freshly dug beds left in a rough condition.

Potatoes are a rewarding crop to grow in the home garden and under suitable conditions will amply repay the little attention they require during the growing period. Varieties recommended are Kennebec, Exton or Sebago. Seed may be planted in July in areas where frost is not a problem.

Perennial vegetables asparagus and rhubarb may be planted out and garden peas sown in July.

JULY SOWING AND PLANTING GUIDE.

| Crop. | Varieties. | Method of Sowing. | Depth of Sowing. | Distance between Rows. | Distance between Plants. |
|---|---|---|---|---|---|
| | | | ins. | ft. in. | ft. in. |
| Asparagus + .. | Mary Washington .. California 500 .. | Crowns .. | 5 | 4 0 | 1 4 |
| Artichoke .. .. | Jerusalem .. Chinese .. .. | Tubers .. | 6 | 3 0 | 1 6 |
| Broad Bean .. .. | Leviathan Longpod .. | Seed .. | 2½–3 | 3 0 | 0 9 |
| Endive .. .. | Batavian Full Heart .. | Seed .. | ½ | 1 0 | 0 10 |
| Lettuce .. .. | Imperial D .. .. | Seed .. | ½ | 1 6 | 0 10 |
| Onion .. .. | Australian Brown .. .. | Seed .. | 1 | 1 0 | 0 6 |
| Parsley .. .. | Triple Curled .. .. | Seed .. | ½ | 1 0 | 0 10 |
| Peas .. .. .. | William Massey .. Green Feast .. | Seed .. | 1½–2 | 1 3 | 0 3 |
| Radish .. | French Breakfast .. .. | Seed .. | ½ | 0 10 | 0 1½ |
| Rhubarb .. | Wilsons Ruby .. Stones Everbearing | Crowns .. | .. | 3 0 | 2 6 |
| Turnip— | | | | | |
| White .. | White Egg .. | Seed .. | ½ | 1 0 | 0 4 |
| Swede .. | Laing's Garden .. | Shed .. | .. | 1 3 | 0 6 |


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